

DOUGLAS

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MISSILE & SPACE SYSTEMS DIVISION  
DOUGLAS AIRCRAFT CO. INC.

ENGINEERING LABORATORIES & SERVICES  
TECHNICAL MEMORANDUM

CATALOG NO. 101-013-1

TO: J. L. Wittaker, A-290  
FROM: F. J. Sorano, A-270; ext. 2461  
SUBJECT: SOUND PRESSURE LEVEL TRANSDUCERS  
VIBRATION AND SHOCK TESTS  
COPIES TO: J. L. Holmgren, N. Mincks, G. Cameron,  
H. B. Mitchell, P. R. Wyatt, Jr.,  
B. Tucker, J. Hillman, A3-500;  
R. V. Egan, A-860; J. W. Trumpy, A-300;  
E. Collins, A2-203, C. W. Wilson A3-500 (11)

REPORT NO. 70-2623-6

DATE 7/1/70

REQUESTED BY J. L. Holmgren

DRAWING 27184 / 2734, 100-1300653 Rev

TEST PLAN & ITEM NO. 4-20-60-20A 41412

SALES ORDER 5769-0506

CLASSIFICATION UNCLASSIFIED  
OR RESTRICTION:

INTRODUCTION

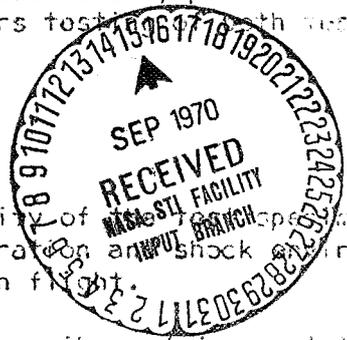
Vibration and shock tests were performed for qualification testing of a group of sound pressure level transducers. The tests were conducted at the vibration and shock facility of the Douglas Dynamics Laboratory, Santa Monica, California, from March 3 through March 5, 1966.

Two sets of test specimens were tested. Test specimen 1 failed functionally after testing in the first axis; test specimen 2 successfully passed the tests in all three axes. This technical memorandum covers testing of both test specimens.

PURPOSE

The purpose of the tests was to determine the ability of the specimens to function properly during and after exposure to vibration and shock environments which simulated the conditions to be encountered in flight.

The purposes of this technical memorandum are to describe and document the vibration and shock portions of the tests and to transmit the vibration and shock data obtained from the tests.



FACILITY FORM 602  
N70-7623-6  
(ACCESSION NUMBER)  
54  
(PAGES)  
CR-113214  
(NASA CR OR TMX OR AD NUMBER)  
(THRU)  
None  
(CODE)  
(CATEGORY)

		DOUGLAS AIRCRAFT CO., INC. MISSILE & SPACE SYSTEMS DIVISION SANTA MONICA, CALIFORNIA	<b>QUALIFICATION STATEMENT</b>	<input checked="" type="checkbox"/> DE/Q TEST <input type="checkbox"/> FORMAL QUAL
PROGRAM	SATURN	MODELS-IV-B	TEST PLAN LINE ITEM NUMBER	W36 & W36A
TEST PLAN LINE ITEM TITLE	TRANSDUCER, SOUND PRESSURE LEVELS		PART NO.	1A68708-1 1A68708-505
TECHNICAL MEMORANDUM NUMBER(S)	TM-DSV-4B-EE-R-5487		TM-DSV-4B-EE-R-5618	
REFERENCE TECHNICAL MEMO. NUMBER(S)	TM-DSV-4B-ENV-R-5487-1 TM-DSV-4B-ENC-R-5487-2			
FAILURE AND REJECTION REPORT (FARR) TAG NUMBER(S) AND DISPOSITION A185941 W36, S/N 309, CHANNEL 3 OUTPUT FAILED, PART IDENTIFIED "NOT FOR PRODUCTION USE" AND ROUTED TO JOHN KNAUL, SATURN TASK FORCE ENGINEERING (USE CONTINUATION SHEET AS NECESSARY)				
ENGINEERING RESOLUTIONS AND CONCLUSIONS THE FAILURE OF S/N 309 CHANNEL 3 WAS CONSIDERED A RANDOM OCCURRENCE AND THE OUT-OF-TOLERANCE CONDITIONS ENCOUNTERED DURING THE TESTS WERE MARGINAL, THUS ACCEPTABLE TO THE COGNIZANT DESIGN ENGINEERING SECTION. (USE CONTINUATION SHEET AS NECESSARY)				
STATEMENT OF QUALIFICATION BASED UPON THE QUALIFICATION TEST RESULTS PRESENTED IN THE ATTACHED REPORT, IT IS THE CONCLUSION OF THE DOUGLAS AIRCRAFT COMPANY, INC., THAT THE ABOVE ITEM QUALIFIED FOR USE AS INTENDED ON SATURN S-IVB.				
ORIGINATOR	DESIGN TECHNOLOGY BRANCH CHIEF	DESIGN TECHNOLOGY CHIEF ENGINEER		
D. E. WOODS <i>D. E. Woods</i>	<i>D. Shields</i>	<i>W. Anderson</i>		
TITLE TEST DIRECTOR				
RELIABILITY ENGINEERING	PROJECT OFFICE TEST BRANCH			
<i>W. Anderson</i>				

EQUIPMENT

Test Specimens

Two test specimens were used. Each test specimen included two transducers. Each transducer consisted of a microphone and an amplifier. The components were identified as follows:

TEST SPECIMEN 1

<u>ITEM</u>	<u>PART NO.</u>	<u>SERIAL NO.</u>	<u>LINE ITEM</u>
Transducer	DAC 1A68708-1 New	310	W-36
Amplifier	Glennite FT-3660	---	----
Microphone	Glennite 379661	---	----
Transducer	DAC 1A68708-505 New	342	W-36A
Amplifier	Glennite FT-3660	---	----
Microphone	Glennite 379662	---	----

TEST SPECIMEN 2

<u>ITEM</u>	<u>PART NO.</u>	<u>SERIAL NO.</u>	<u>LINE ITEM</u>
Transducer	DAC 1A68708-1 New	309	W-36
Amplifier	Glennite FT-3660	---	----
Microphone	Glennite 379661	---	----
Transducer	DAC 1A68708-505 New	308	W-36A
Amplifier	Glennite FT-3660	---	----
Microphone	Glennite 379662	---	----

Each test specimen also included a section of vehicle skin with associated bracketry, wiring, and hardware.

Each test specimen was, in turn, assembled and installed on a rigid vibration test fixture in a manner which dynamically simulated the vehicle installation. The test fixture was identified as 1/N 1T07187 and weighed approximately 40 pounds.

EQUIPMENT (continued)

Test Equipment

Vibration and shock test equipment included the following:

ITEM	MANUFACTURER	MODEL	NO.
Oscillograph	CEC	5-124	624070
Galvanometers (5)	CEC	3-326	*
Waveform Synthesizer	Exact	100	634060
Monoscope	Hughes	104	632152
Charge Amplifiers (5)	Endevco	*	*
Amplifier	Endevco	2614	611825-33
Tape Recorder	Ampex	FR-10	640519
Spectral Density Equalizer	Ling	ASDE-30	611825-12
X-Y Recorder	Moseley	2	AF 1189-9
Oscillator	Technical Prod.	TP626	611595-2
Analyzer	Technical Prod.	TP627	611595-3
Integrator	Technical Prod.	TP633	611595-1
Vibration System	Ling	A-249	611825
Accelerometers (5)	Endevco	*	*

\* Channel assignments and instrumentation information are presented on pages A1 through A3.

Accuracy and repeatability were verified by the current Calibration and Certification stickers on the test equipment.

PROCEDURE

The test specimen was attached to the shaker head, and accelerometers were mounted as shown on page B1.

Tests, consisting of sinusoidal sweeps, random excitation, and shock pulses were then conducted in each of the three mutually perpendicular axes shown on page B1.

PROCEDURE (continued)

Sinusoidal sweeps were performed from 5 to 2000 to 5 cps with the frequency changing at the rate of one octave per minute. Input levels were as follows:

<u>FREQUENCY (cps)</u>	<u>LEVEL</u>
5 - 47	.02 inch D.A. Disp.
47 - 200	0.0g (0 - peak)
200 - 295	.0022 inch D.A. Disp.
295 - 2000	10.0g (0 - peak)

Sinusoidal data were recorded on oscillograph charts.

Random vibration tests were performed for each axis in the following steps:

1. The spectral density equalizer was set to 1/4 power and the spectrum was checked visually by examining the equalizer meters.
2. When the setting appeared satisfactory, a brief full-power run was made, during which time the signal response of the control accelerometer was recorded on a magnetic tape loop and analyzed.
3. When the tape loop showed a satisfactory spectrum, the remainder of the full-power run was completed.

Random vibration tests were performed for a total duration of 12 minutes in each axis. Input levels were as follows:

<u>FREQUENCY (cps)</u>	<u>LEVEL</u>
20 - 85	.065 g <sup>2</sup> /cps
85 - 280	+6.3 db/octave
280 - 1000	0.8 g <sup>2</sup> /cps
1000 - 2000	-12.0 db/octave

Random data were recorded on FM tape.

Before the shock tests were performed, system accuracy was checked as follows:

1. Horizontal scale accuracy was verified by the Calibration and Certification sticker on the memoscope.
2. Vertical input accuracy was checked by inserting a known calibration signal and adjusting the memoscope potentiometer until the trace peaks coincided with the desired vertical scale divisions.

PROCEDURE (continued)

Shock pulses were shaped by a waveform synthesizer, displayed on a oscilloscope, and photographed by a Polaroid camera. The input level for all axes was as follows:

Number . . . . . Three pulses per axis  
Input Shape . . . . . Half sine wave  
Acceleration . . . . . 20g (0 - peak)  
Duration . . . . . 10 ±2 milliseconds

Functional requirements were monitored by the prime laboratory before, during, and after vibration and shock testing.

RESULTS AND DISCUSSION

A discussion of the functional failure which occurred to test specimen 1 after testing in the first (C) axis is provided in TM-DSV4B-E/E-R5487.

Sinusoidal sweep data are presented as plots of Acceleration versus Frequency on the following pages:

<u>SPECIMEN</u>	<u>AXIS</u>	<u>PAGE NUMBER</u>
2	A	A4 through A8
2	B	A9 through A13
2	C	A14 through A18
1	C	A19 through A23

Random vibration data are presented as plots of Power Spectral Density versus Frequency on the following pages:

<u>SPECIMEN</u>	<u>AXIS</u>	<u>PAGE NUMBER</u>
2	A	A23 through A31
2	B	A32 through A36
2	C	A37 through A41
1	C	A42 through A46

Equalization plots of the random inputs as approved by the Task Force representative are presented on pages A24 through A27.

RESULTS AND DISCUSSION (continued)

Shock test data for test specimen 2 are presented as photographic plots of Acceleration versus Time on page A47.

Post-test examination of test specimen 2 revealed no structural failures resulting from vibration and shock testing.

*for* ORIGINATOR F. N. McKewey  
D. P. Torchin

T. J. Sereno  
T. J. Sereno, Section Chief  
Acoustics and Dynamics  
Environmental Laboratories

ATTACHMENTS

Pages A1 through A47

Page B1

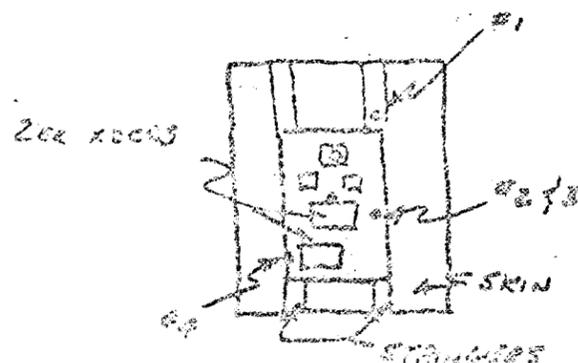
REPORT No. R5487-1  
 PAGE A1  
 SHEET 1 OF 3  
 DATE 3/5/66  
 LINE ITEM W36/W36A  
 RUN No. SINE & RANDOM  
 AXIS "A"

TEST TITLE SOUND PRESSURE LEVEL XDCRS  
 S/O 5769-6804 EWO 2222/2223 TCD 1708860  
 P/N SPECIMEN SEE NOTE JWO 51924  
 ENGINEER TORCHIN/DAVIS EXT 2465  
 TECHNS. MANH/NAKASHIMA  
 STANDARD ACCEL. TYPE \_\_\_\_\_ S/N \_\_\_\_\_ CAL. DUE \_\_\_\_\_

TAPE REC. MODEL \_\_\_\_\_ S/N \_\_\_\_\_ FACILITY A249 UNIT 12F  
 RECORD SPEED \_\_\_\_\_ IN/SEC. \_\_\_\_\_ TAPE REEL No. \_\_\_\_\_  
 OSCILLOGRAPH TYPE 5-124 S/N \_\_\_\_\_  
 PAPER SPEED 25 mm/IN/SEC \_\_\_\_\_  
 TIMING LINES \_\_\_\_\_ SEC. PAPER \_\_\_\_\_

CHAN. NO.	TAPE REC. CHAN.	OSC. CHAN.	XDCR CABLE No.	MEASUREMENT LOCATION	RESP AXIS	XDCR MODEL	SERIAL NO.	XDCR AMP. MODEL	SERIAL NO.	OSC. GALVO MODEL	SERIAL NO.	TAPE REC. AMP. MODEL	SERIAL No.	FULL SCALE g's	INSERT TRV	pc/gpc	CHAN. NO.
1			1	CONTROL - ON SKIN	A	2225C	1856	2718A	K227	7-326	18550		14	0.1MVP	PME	1.92	1
2			2	INPUT TO TOP XDCR	A	2242C	1854		K225		6001					1.92	2
3			3	" " " " } AXIAL	C	2242C	1814		K221		18350					1.81	3
4			4	INPUT TO LOWER XDCR	A	2242C	1887		K224		18348					1.83	4
5			5	ON TOP XDCR	A	2226	1814	2718A	K222	7-326	5610					2.48	5
6																	6
7																	7
8																	8
9																	9
10																	10
11																	11
12																	12
13																	13
14																	14
15																	15
16																	16
17																	17
18																	18

NOTES & SKETCHES:



(1) FIRST SET OF PARTS:

P/N 1A68708-1 S/N 310 (W36)  
 P/N 1A68708-505 S/N 342 (W36A)

(2) SECOND SET OF PARTS:

P/N 1A68708-1 S/N 309 (W36)  
 P/N 1A68708-505 S/N 308 (W36A)

TEST TITLE SOUND PRESSURE LEVEL XDCRS

TAPE REC. MODEL - S/N -

FACILITY 4242 UNIT 128

S/O 5769-6604 EWO JWO TCD. 1708860

RECORD SPEED - IN/SEC -

TAPE REEL No. -

R/N SPECIMEN SEE NOTE

OSCILLOGRAPH TYPE 5-129 S/N -

ENGINEER TORCHIN/DAVIS EXT. 2465

PAPER SPEED 25 IN/SEC -

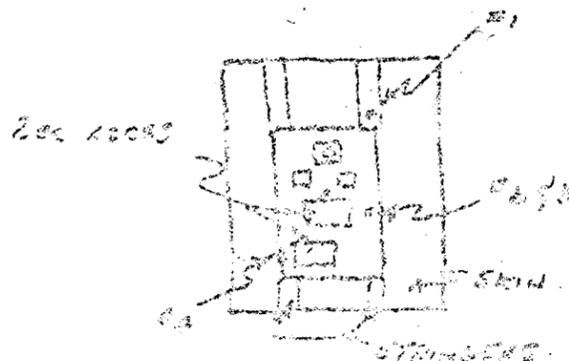
TECHNS. MANN/NAKASHIMA

TIMING LINES - SEC. PAPER -

STANDARD ACCEL TYPE - S/N - CAL. DUE -

CHAN. NO.	TAPE REC. CHAN.	OSC. CHAN.	XDCR CABLE No.	MEASUREMENT LOCATION	RESP. AXIS	XDCR MODEL	SERIAL NO.	XDCR AMP. MODEL	SERIAL NO.	OSC. GALVO MODEL	SERIAL NO.	TAPE REC. AMP. MODEL	SERIAL NO.	FULL SCALE g's	INSERT mV	pc/g's	CHAN. NO.
1			1	CONTROL - ON SKIN	B	2225C	W356	2713A	KB27	7-326	13550		19	0.1 MV RAC	1/2 PR		1
2			2	INPUT TO TOP XDCR	B	2242C	W394		KB25		6001					1.93	2
3			3	" " " " AXIAL	A	2242C	W414		KB21		13350					1.51	3
4			4	INPUT TO LOWER XDCR	B	2242C	W487		KB24		13348					1.23	4
5			5	ON TOP XDCR	B	2226	W314	2713A	W422	7-326	5610					2.46	5
6																	6
7																	7
8																	8
9																	9
10																	10
11																	11
12																	12
13																	13
14																	14
15																	15
16																	16
17																	17
18																	18

NOTES & SKETCHES:



(1) FIRST SET OF PARTS:

P/N 1A68702-1 S/N 310 (W36)  
 P/N 1A68702-505 S/N 342 (W36A)

(2) SECOND SET OF PARTS:

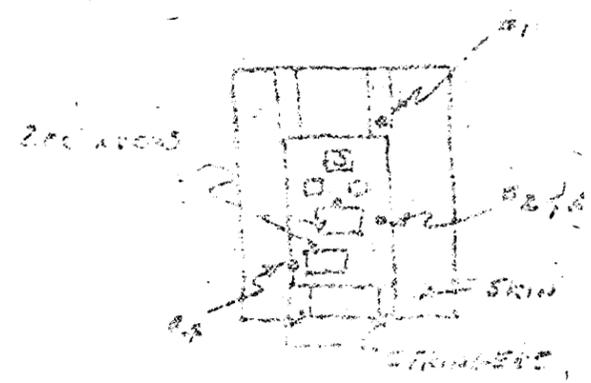
P/N 1A68702-1 S/N 310 (W36)  
 P/N 1A68702-505 S/N 309 (W36A)

REPORT No. R5487-1  
 PAGE A3  
 SHEET 3 OF 3  
 DATE 3/4/66  
 LINE ITEM 426/1030A  
 RUN No. SINE & RANDOM  
 AXIS C

TEST TITLE SOUND PRESSURE LEVELS XDCRS TAPE REC. MODEL 7-276 FACILITY 4249 UNIT 128  
 S/N 500 27384/85 RECORD SHOULD NO TAPE REC. NO. -  
 PIN SPECIMEN 100 OSCILLOGRAPH TYPE 5724 S/N 100  
 ENGINEER TERESA DAVIS EXT 245 PAPER SPEED 25 AMP. NO  
 TECHNS. MANH/NARASHIMA TIMING LINES SEC. PAPER  
 STANDARD ACCEL TYPE SIN CAL DUE -

CHAN NO.	TAPE REC. CHAN	OSC. CHAN	XDCR CABLE NO.	MEASUREMENT	LOCATION	RESP AXIS	XDCR MODEL	SERIAL NO.	XDCR AMP. MODEL	SERIAL NO.	OSC GALVO MODEL	SERIAL NO.	TAPE REC AMP. MODEL	SERIAL NO.	FULL SCALE g's	INSERT MV	PR 3 PR	CHAN NO.
1			1	CONTROL - ON SKIN		C	2285C	A356	27124	K827	7-226	18550		14	0.142	13.5		1
2			2	INPUT TO TOP XDCR	BI-	C	2242C	A394		K225		5001					1.92	2
3			3	" " " "	BI- BI-2	A	2242C	A414		K214		18550					1.31	3
4			4	INPUT TO LOWER XDCR		C	2242C	A417		K224		18349					1.83	4
5			5	ON TOP XDCR		C	2226	6814	27124	K492	7-226	5610					2.46	5
6																		6
7																		7
8																		8
9																		9
10																		10
11																		11
12																		12
13																		13
14																		14
15																		15
16																		16
17																		17
18																		18

NOTES & SKETCHES:



- (1) FIRST SET OF PARTS:  
 P/N 1A68708-1 S/N 310 (1046)  
 P/N 1A68708-2 S/N 342 (10364)
- (2) SECOND SET OF PARTS:  
 P/N 1A68708-1 S/N 310 (1046)  
 P/N 1A68708-2 S/N 342 (10364)

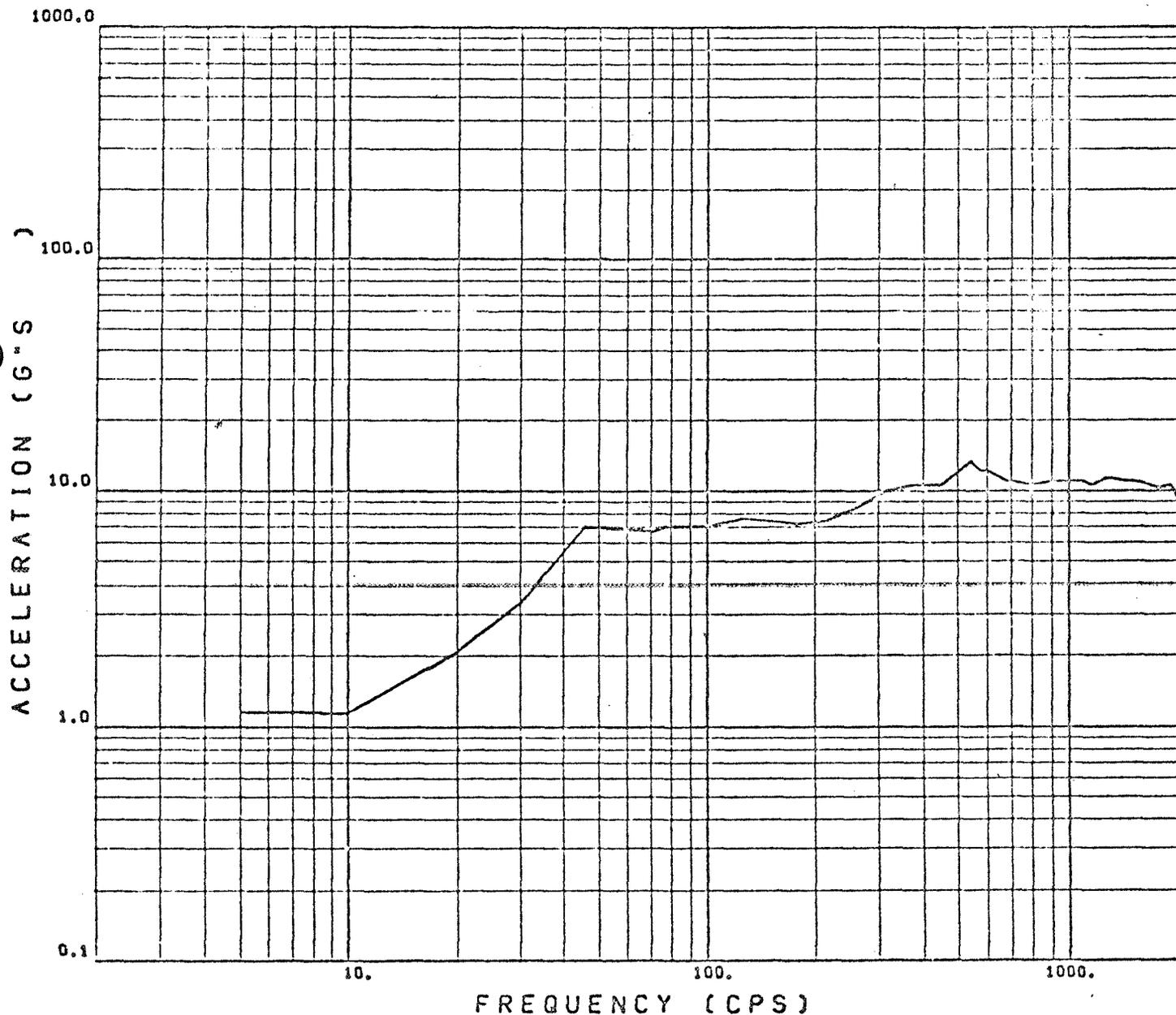
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CONFIGURATION --- SPECIMEN 2  
NOTE... SEE PAGE BL  
FOR PICK UP LOCATION

TEST CONDITIONS....

TEST DATE..... 3/05/66  
AXIS OF EXCITATION.... A  
PICK UP NUMBER ( 1)... 1 H356  
PICK UP RESPONSE.....  
INPUT ACCEL.PER PAGE.. \_\_\_\_\_

LEGEND...  
UPSWEEP ———  
DOWNSWEEP - - - - -



DOUGLAS AIRCRAFT COMPANY, INC.

PAGE NO. A5  
REPORT NO. R5487-1

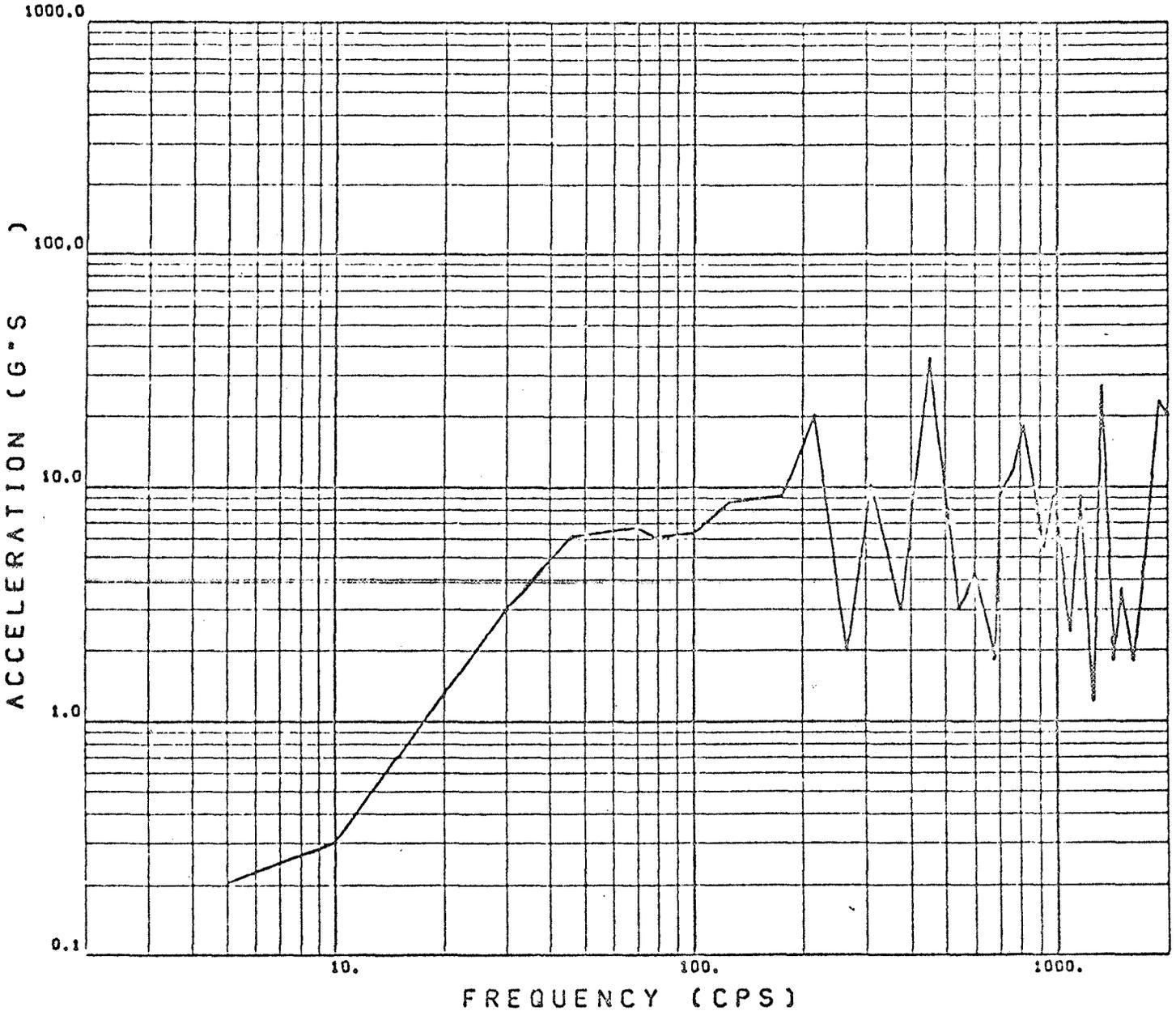
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CONFIGURATION --- SPECIMEN 2  
NOTE... SEE PAGE B2  
FOR PICK UP LOCATION

TEST CONDITIONS...

TEST DATE..... 3/05/66  
AXIS OF EXCITATION... A  
PICK UP NUMBER (2)... 2 HB94  
PICK UP RESPONSE..... A  
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LEGEND...  
UPSWEEP ———  
DOWNSWEEP - - - - -

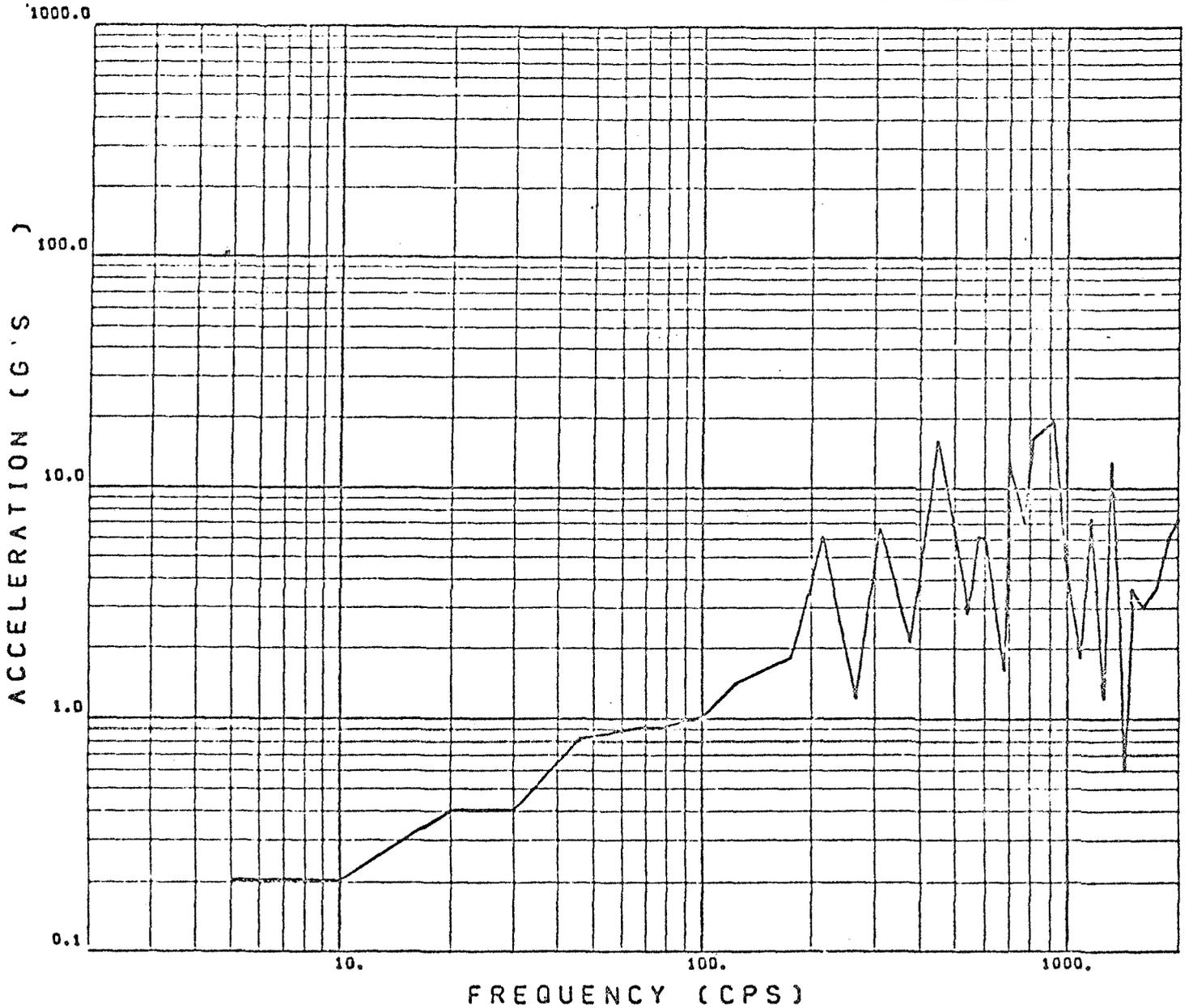


# SINUSOIDAL FREQUENCY SWEEP SIV-B SOUND PRESSURE LEVELS TRANSDUCER W36/W36A

CONFIGURATION --- SPECIMEN 2  
NOTE... SEE PAGE B-1  
FOR PICK UP LOCATION

TEST CONDITIONS....  
TEST DATE..... 3/05/66  
AXIS OF EXCITATION.... A  
PICK UP NUMBER ( )... 3 HA14  
PICK UP RESPONSE..... C  
INPUT ACCEL. PER PAGE.. A7

LEGEND...  
UPSWEEP ———  
DOWNSWEEP - - - - -



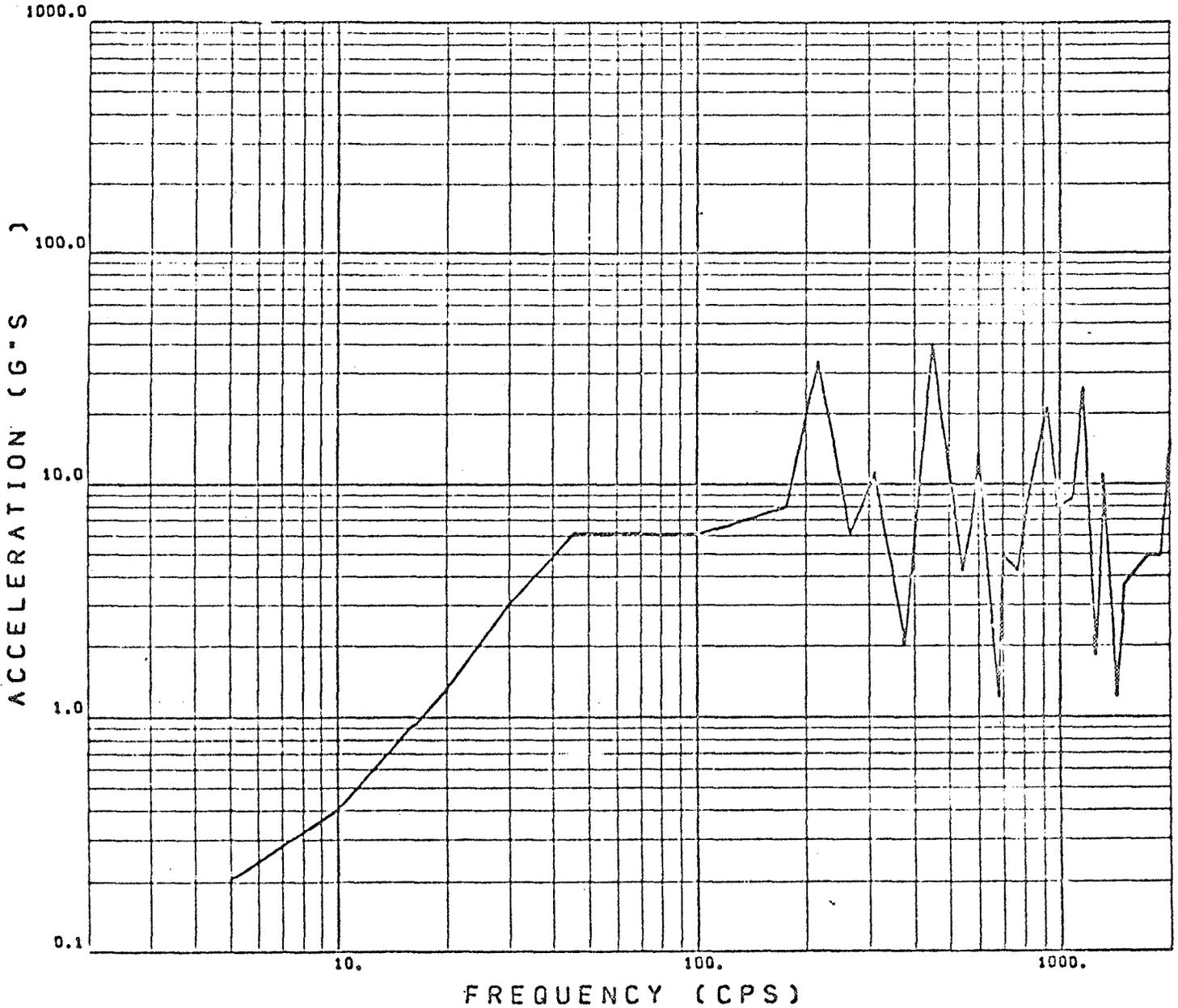
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CONFIGURATION --- SPECIMEN 2  
NOTE... SEE PAGE B1  
FOR PICK UP LOCATION

TEST CONDITIONS....

TEST DATE..... 5/05/66  
AXIS OF EXCITATION.... A  
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LEGEND...  
UPSWEEP ———  
DOWNSWEEP - - - - -



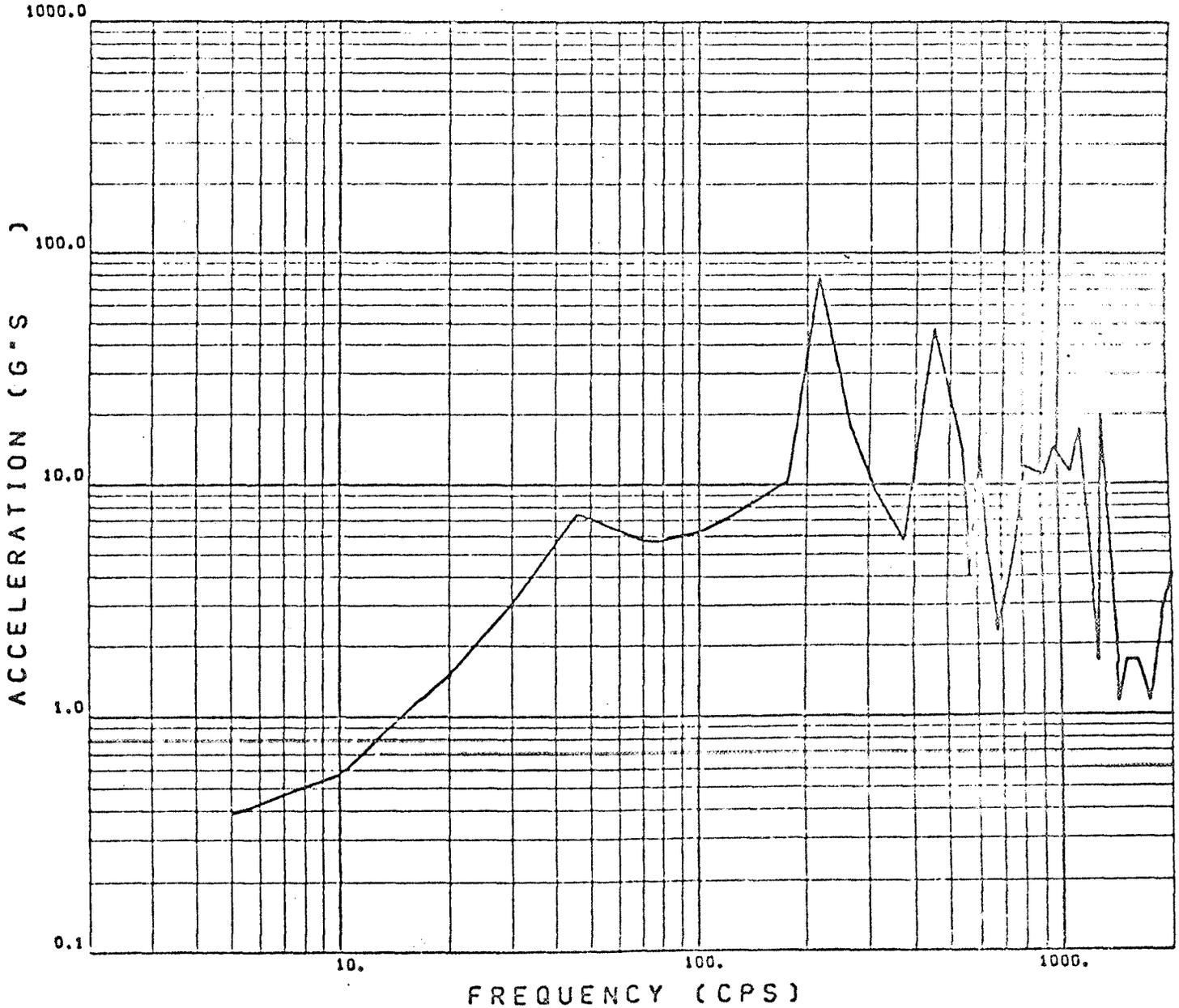
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CONFIGURATION --- SPECIMEN 2  
NOTE... SEE PAGE B1  
FOR PICK UP LOCATION

TEST CONDITIONS....

TEST DATE..... 3/02/56  
AXIS OF EXCITATION.... A  
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LEGEND...  
UPSWEEP ———  
DOWNSWEEP - - - - -



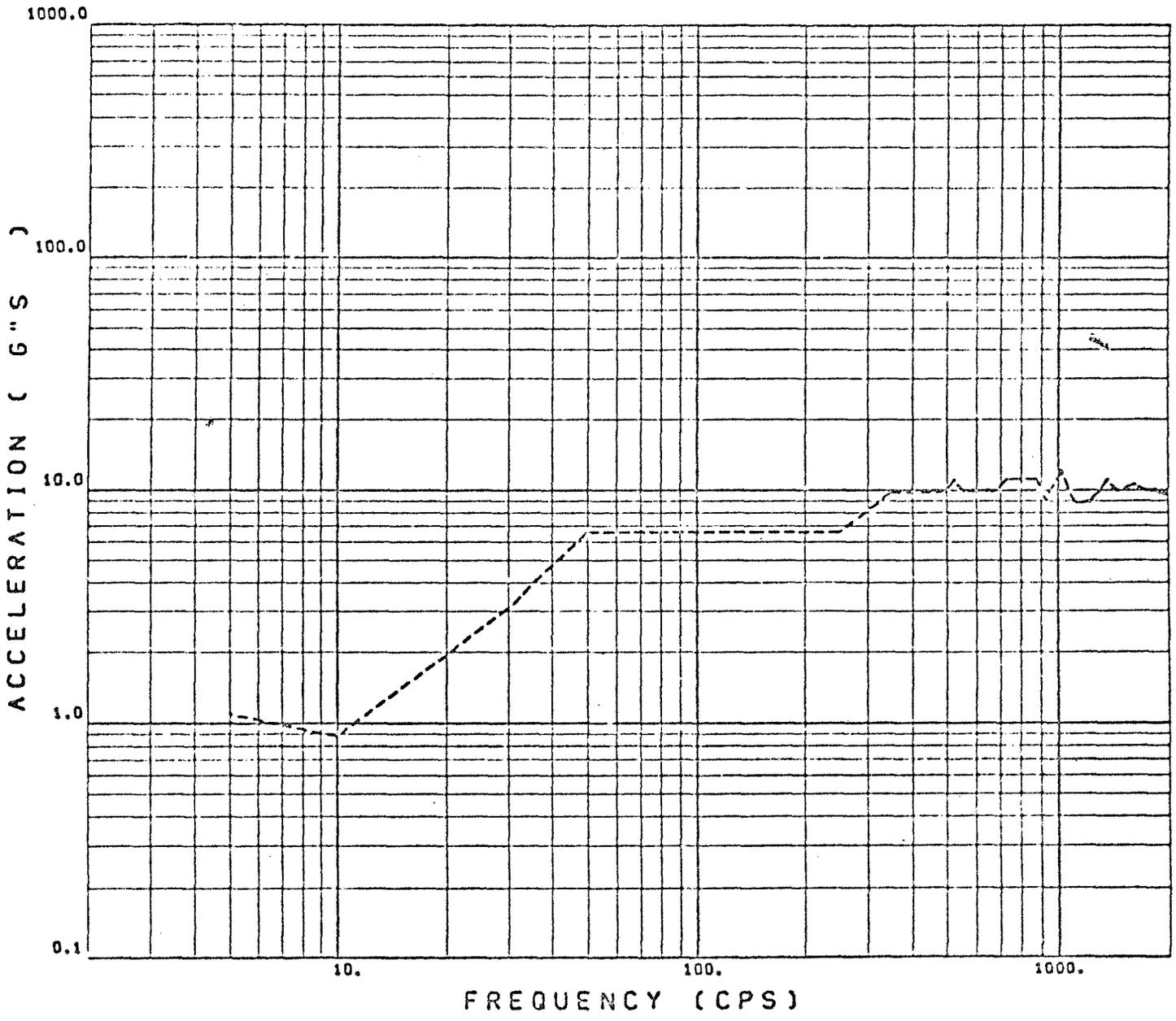
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CONFIGURATION --- SPECIMEN 2  
NOTE... SEE PAGE B1  
FOR PICK UP LOCATION

TEST CONDITIONS....

TEST DATE..... 3104166  
AXIS OF EXCITATION.... 8  
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PICK UP RESPONSE.....  
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LEGEND...  
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DOWNSWEEP - - - - -



DOUGLAS AIRCRAFT COMPANY, INC.

PAGE NO. A10  
REPORT NO. R5489-1

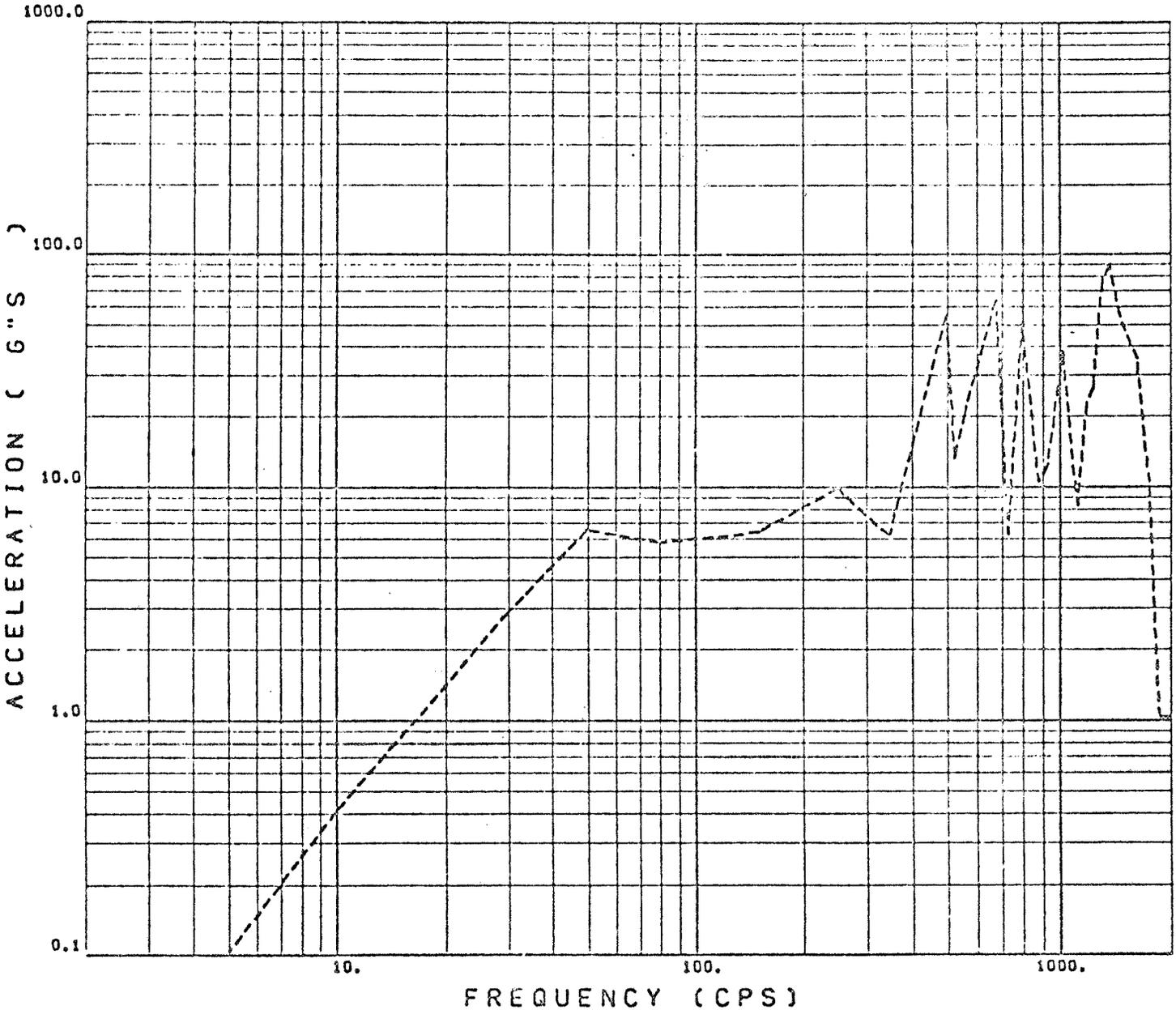
# SINUSOIDAL FREQUENCY SWEEP SIV-B SOUND PRESSURE LEVELS TRANSDUCER W36/W36A

CONFIGURATION --- SPECIMEN 2  
NOTE... SEE PAGE 81  
FOR PICK UP LOCATION

TEST CONDITIONS...

TEST DATE..... 310416E  
AXIS OF EXCITATION... B  
PICK UP NUMBER ( 2 )... 2 HD94  
PICK UP RESPONSE..... B  
INPUT ACCEL. PER PAGE.. 49

LEGEND...  
UPSWEEP ———  
DOWNSWEEP ·····



# SINUSOIDAL FREQUENCY SWEEP SIV-B SOUND PRESSURE LEVELS TRANSDUCER W36/W36A

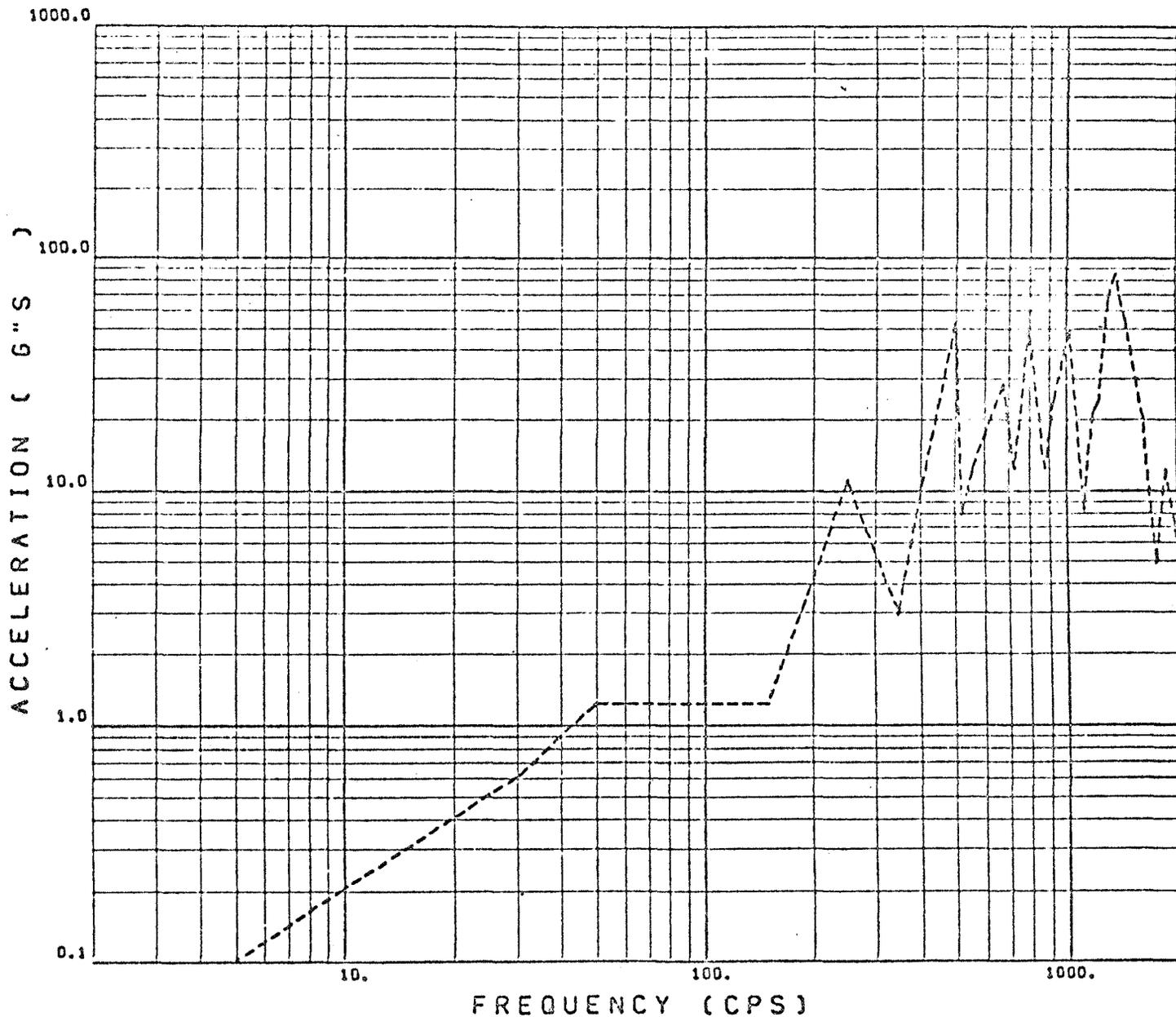
CONFIGURATION --- SPECIMEN 2

NOTE... SEE PAGE B1  
FOR PICK UP LOCATION

TEST CONDITIONS....

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AXIS OF EXCITATION... B  
PICK UP NUMBER ( 3 )... 3 HA14  
PICK UP RESPONSE..... C  
INPUT ACCEL.FER PAGE.. A9

LEGEND...  
UPSWEEP ———  
DOWNSWEEP - - - - -



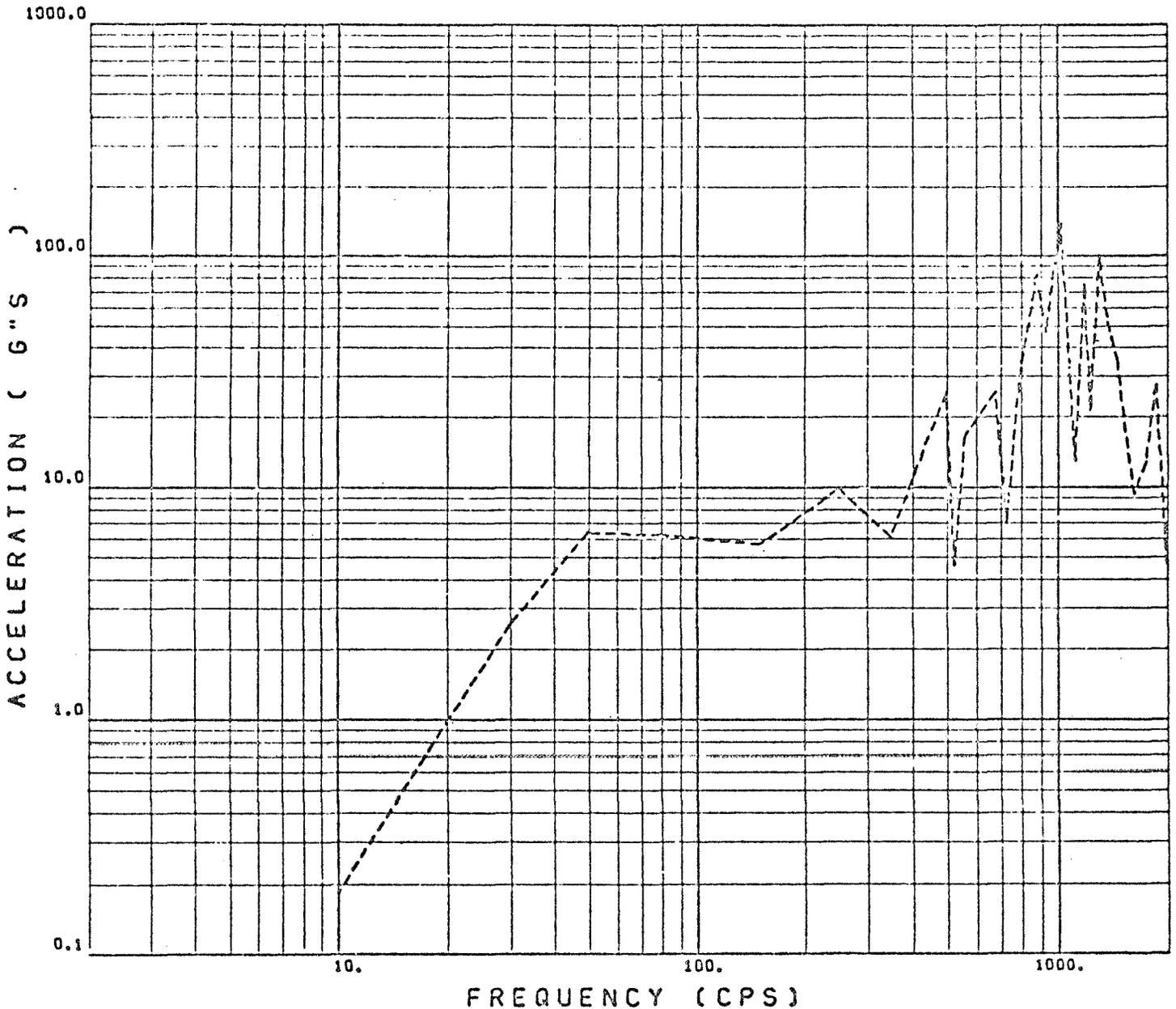
# SINUSOIDAL FREQUENCY SWEEP SIV-B SOUND PRESSURE LEVELS TRANSDUCER W36/W36A

CONFIGURATION --- SPECIMEN 2  
NOTE... SEE PAGE 81  
FOR PICK UP LOCATION

TEST CONDITIONS....

TEST DATE..... 3104166  
AXIS OF EXCITATION.... B  
PICK UP NUMBER ( 4)... 4 FA87  
PICK UP RESPONSE..... B  
INPUT ACCEL. PER PAGE.. A9

LEGEND...  
UPSWEEP ———  
DOWNSWEEP - - - - -



DOUGLAS AIRCRAFT COMPANY, INC.

PAGE NO. A13  
REPORT NO. R5487-1

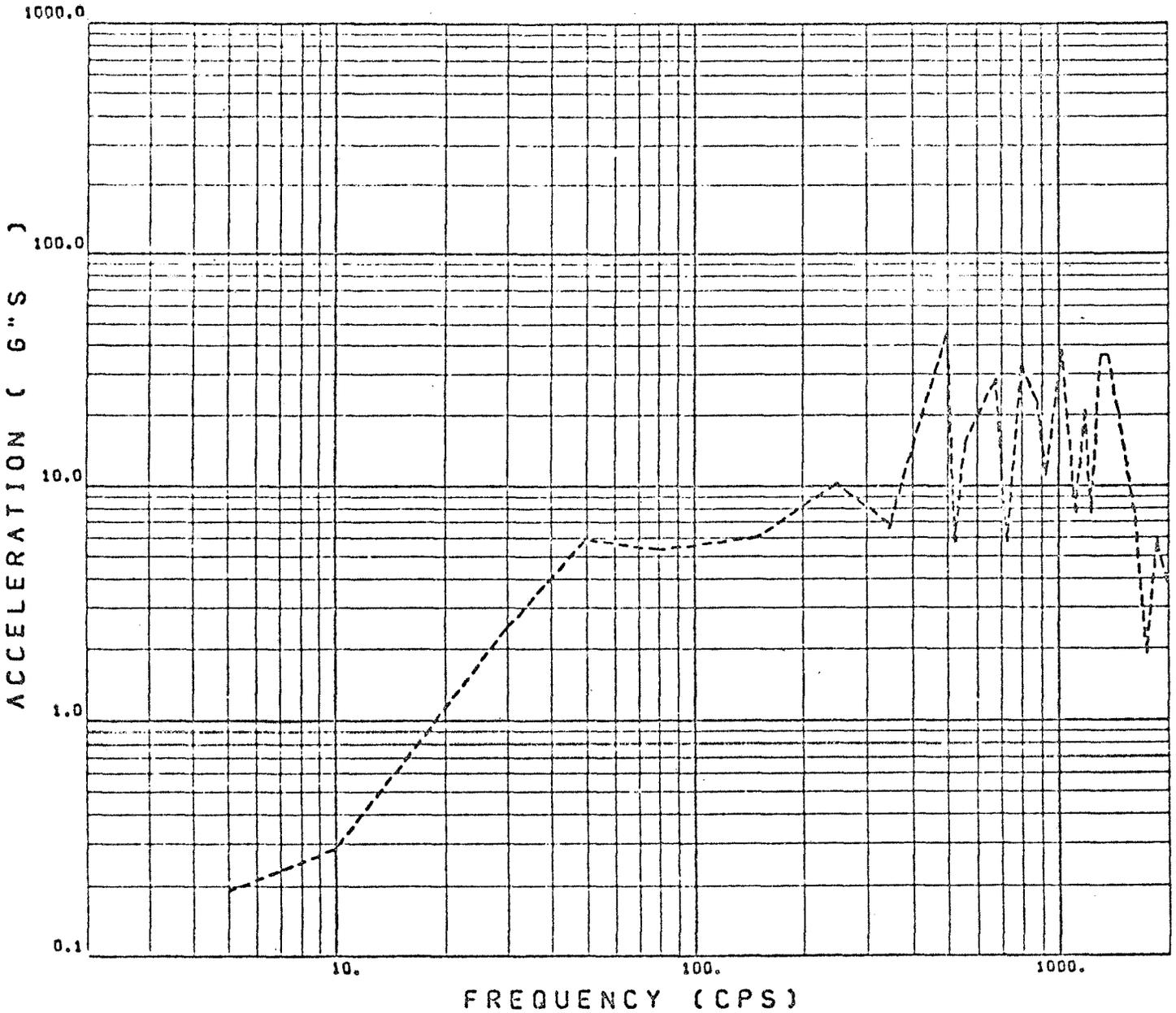
# SINUSOIDAL FREQUENCY SWEEP SIV-B SOUND PRESSURE LEVELS TRANSDUCER W36/W36A

CONFIGURATION --- SPECIMEN 2  
NOTE... SEE PAGE 81  
FOR PICK UP LOCATION

TEST CONDITIONS...

TEST DATE..... 3104166  
AXIS OF EXCITATION.... B  
PICK UP NUMBER ( 5)... 5 LB14  
PICK UP RESPONSE..... B  
INPUT ACCEL. PER PAGE.. A9

LEGEND...  
UPSWEEP ———  
DOWNSWEEP - - - - -



DOUGLAS AIRCRAFT COMPANY, INC.

PAGE NO. A14  
REPORT NO. R5487-1

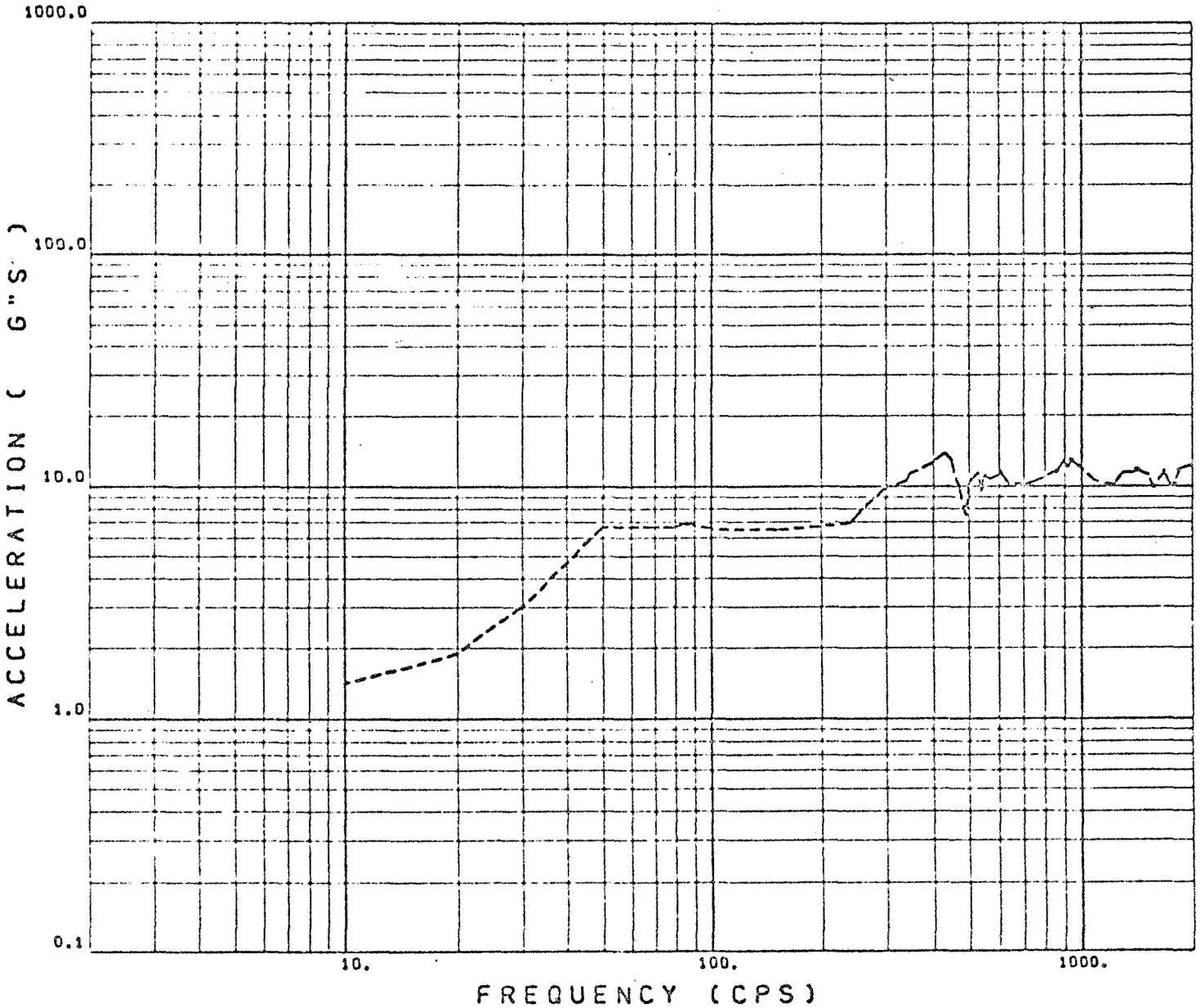
# SINUSOIDAL FREQUENCY SWEEP SIV-B SOUND PRESSURE LEVEL XDUCCERS (W36 + W36A)

CONFIGURATION ---  
NOTE... SEE PAGE B1  
FOR PICK UP LOCATION

TEST CONDITIONS...

TEST DATE..... 3/04/68  
AXIS OF EXCITATION... C SPEC. 2  
PICK UP NUMBER ( 1)... 1 HB56  
PICK UP RESPONSE.....  
INPUT ACCEL.PER PAGE.. \_\_\_\_\_

LEGEND...  
UPSWEEP ———  
DOWNSWEEP - - - - -



DOUGLAS AIRCRAFT COMPANY, INC.

# SINUSOIDAL FREQUENCY SWEEP SIV-B SOUND PRESSURE LEVEL XDUCCERS (W36 + W36A)

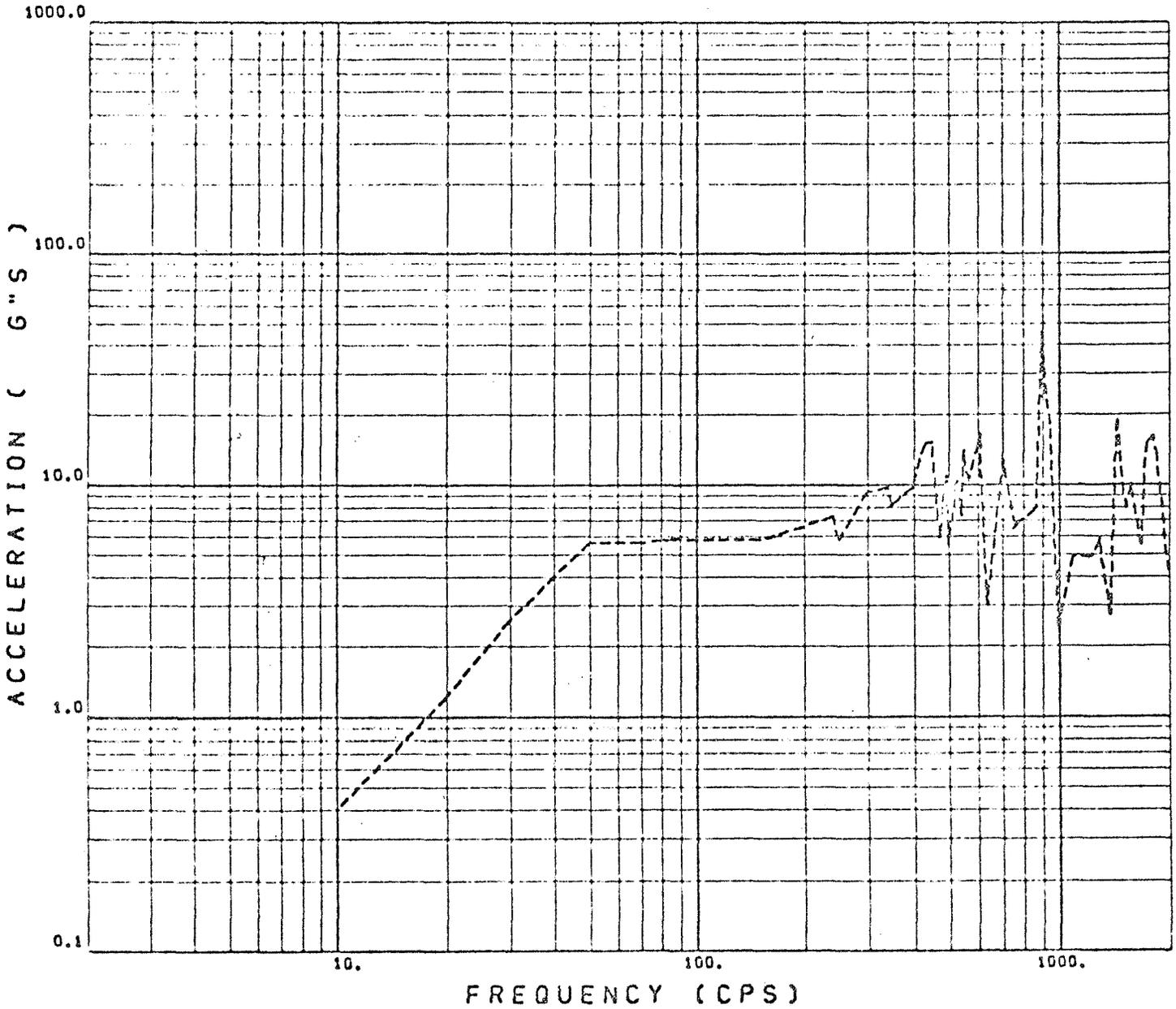
PAGE NO. A15  
REPORT NO. PS487-1

CONFIGURATION ---  
NOTE... SEE PAGE B1  
FOR PICK UP LOCATION

TEST CONDITIONS....

TEST DATE..... 3/04/66  
AXIS OF EXCITATION.... C SPEC. 2  
PICK UP NUMBER ( 2)... 2 HB94  
PICK UP RESPONSE..... C  
INPUT ACCEL. PER PAGE.. A17

LEGEND...  
UPSWEEP ———  
DOWNSWEEP - - - - -



DOUGLAS AIRCRAFT COMPANY, INC.

PAGE NO. A16  
REPORT NO. R5487-1

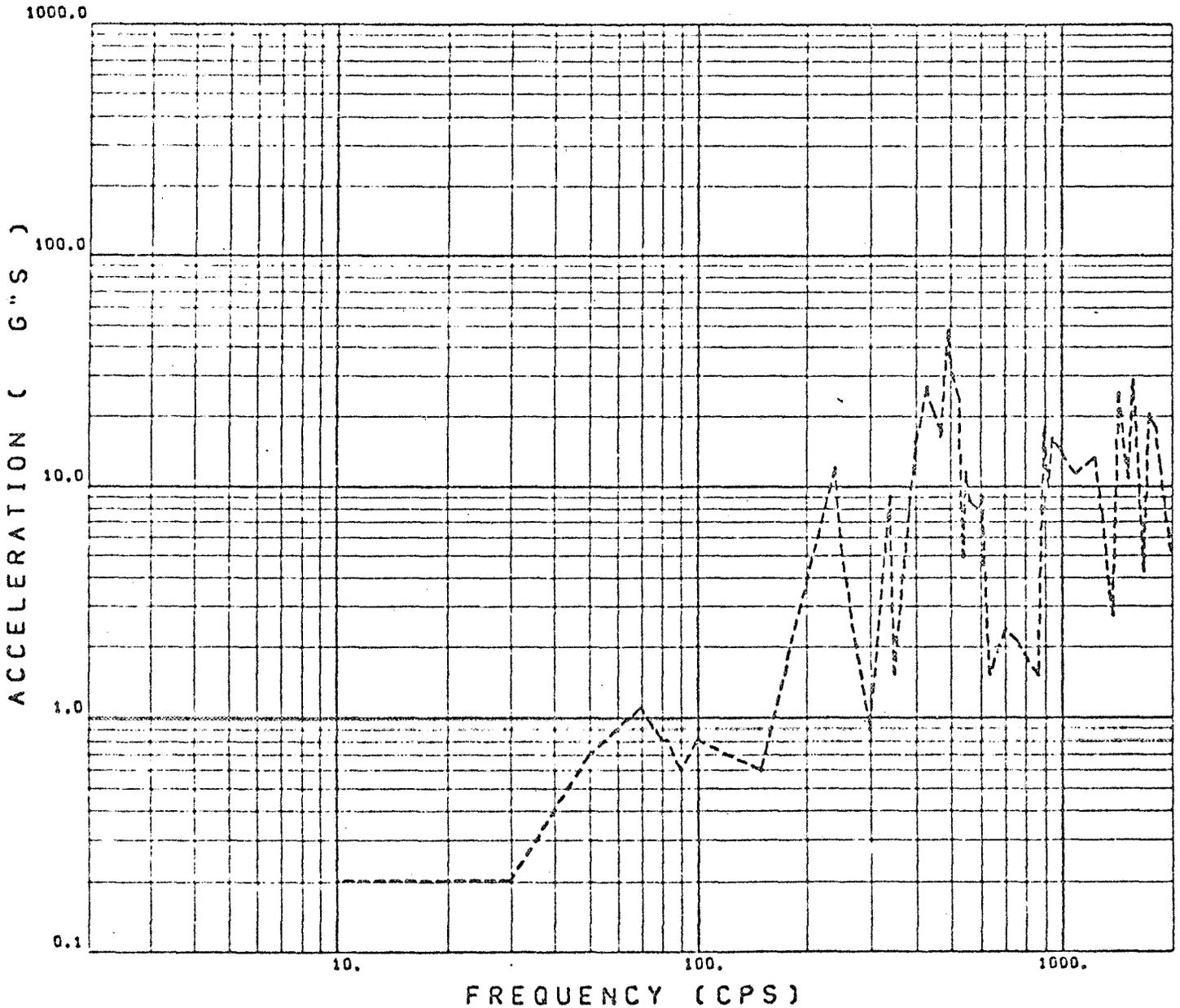
# SINUSOIDAL FREQUENCY SWEEP SIY-B SOUND PRESSURE LEVEL XDUCCERS (W36 + W36A)

CONFIGURATION ---  
NOTE... SEE PAGE B1  
FOR PICK UP LOCATION

LEGEND...  
UPSWEEP ———  
DOWNSWEEP - - - - -

TEST CONDITIONS....

TEST DATE..... 3/04/66  
AXIS OF EXCITATION... C SPEC. 2  
PICK UP NUMBER (3)... 3 HA14  
PICK UP RESPONSE..... A  
INPUT ACCEL.PER PAGE.. A17



DOUGLAS AIRCRAFT COMPANY

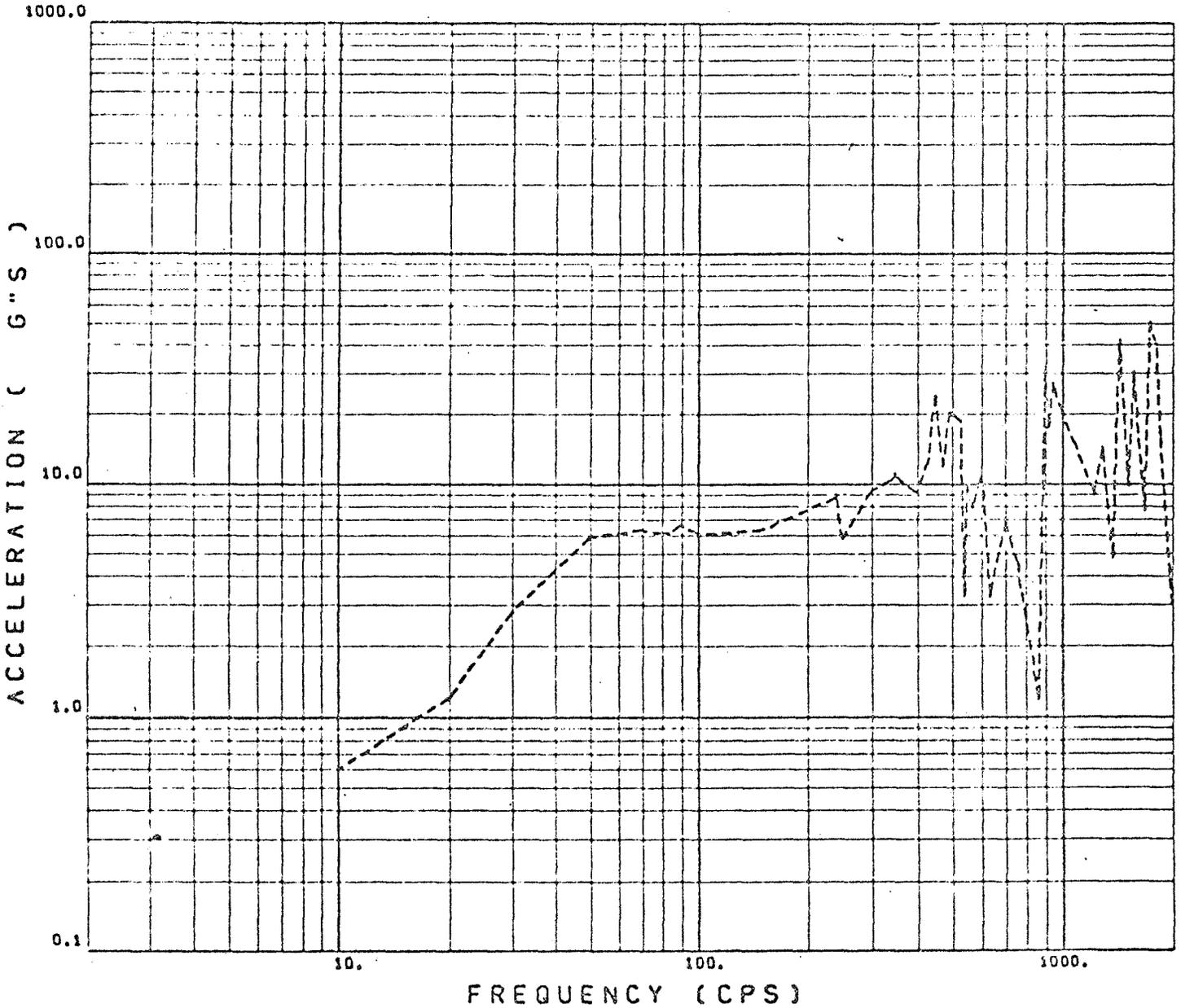
PAGE NO. A17  
REPORT NO. RS487-1

# SINUSOIDAL FREQUENCY SWEEP SIV-B SOUND PRESSURE LEVEL XDUCCERS (W36 + W36A)

CONFIGURATION ---  
NOTE... SEE PAGE B1  
FOR PICK UP LOCATION

LEGEND...  
UPSWEEP ———  
DOWNSWEEP - - - - -

TEST CONDITIONS...  
TEST DATE..... 3/04/66  
AXIS OF EXCITATION... C SPEC. 2  
PICK UP NUMBER ( 4)... 4 FAB7  
PICK UP RESPONSE..... C  
INPUT ACCEL.PER PAGE.. A14



DOUGLAS AIRCRAFT COMPANY, INC.

PAGE NO. A18  
REPORT NO. R5487-1

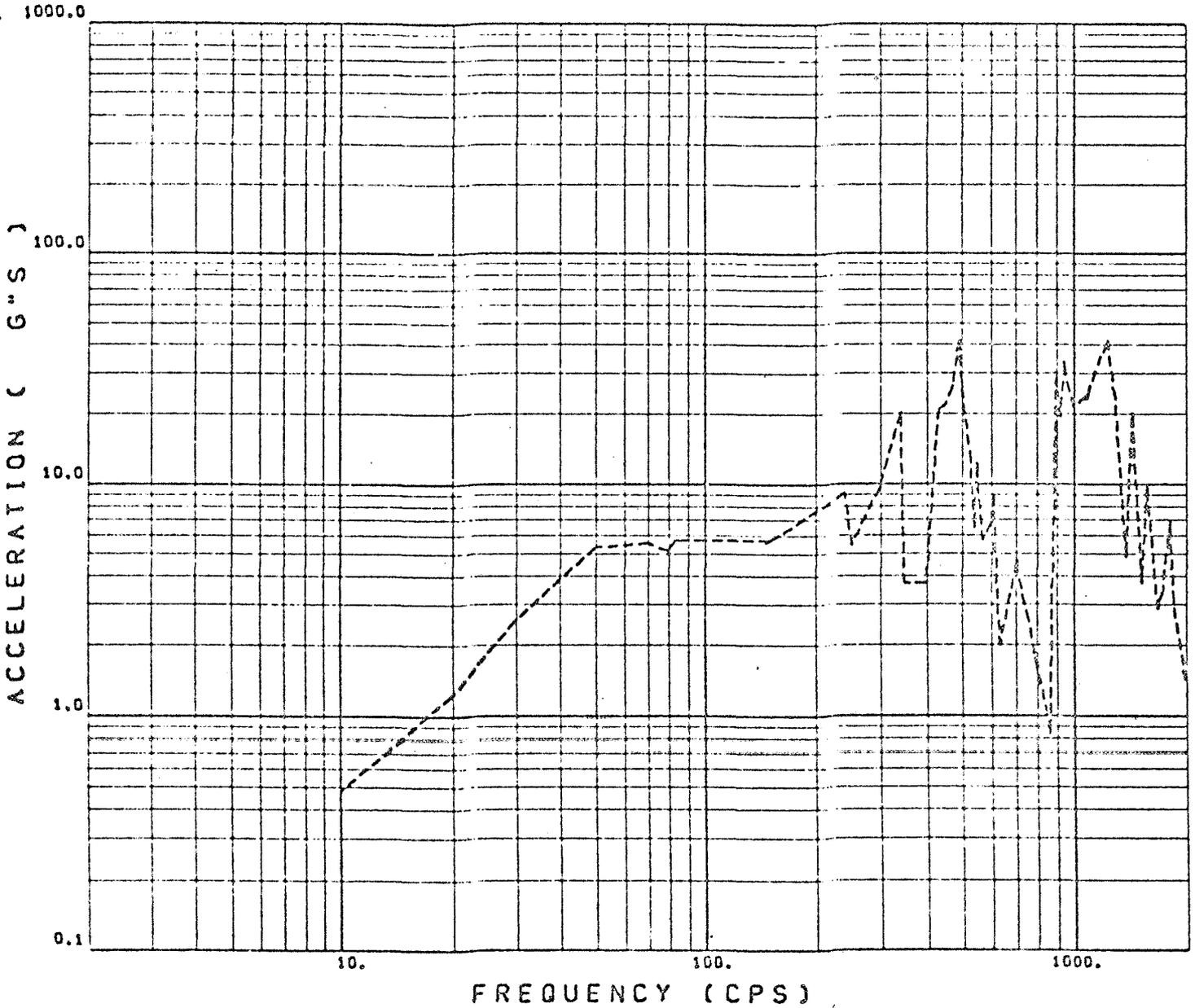
# SINUSOIDAL FREQUENCY SWEEP SIV-B SOUND PRESSURE LEVEL XDUCCERS (W36 + W36A)

CONFIGURATION ---  
NOTE... SEE PAGE B1  
FOR PICK UP LOCATION

### TEST CONDITIONS...

TEST DATE..... 3/04/68  
AXIS OF EXCITATION... C SPEC. 2  
PICK UP NUMBER (S)... 8 L914  
PICK UP RESPONSE..... C  
INPUT ACCEL. PER PAGE.. A14

LEGEND...  
UPSWEEP ———  
DOWNSWEEP - - - -



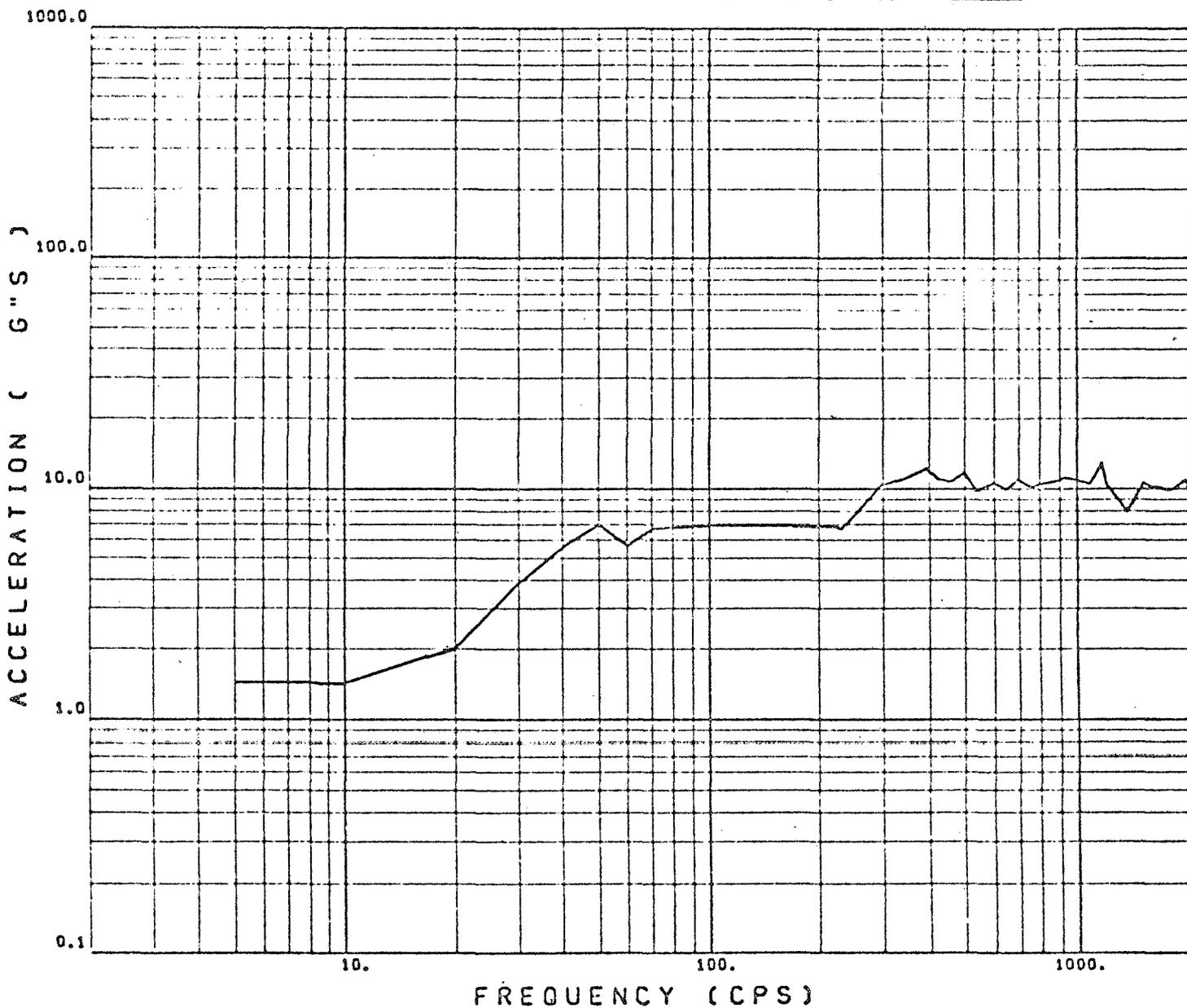
# SINUSOIDAL FREQUENCY SWEEP SIV-B SOUND PRESSURE LEVEL XDUCCERS (W36 + W36A)

CONFIGURATION ---  
NOTE... SEE PAGE B1  
FOR PICK UP LOCATION

TEST CONDITIONS....

TEST DATE..... 3/03/66  
AXIS OF EXCITATION... C SPEC. 1  
PICK UP NUMBER ( 1)... HB56  
PICK UP RESPONSE.....  
INPUT ACCEL. PER PAGE.. \_\_\_\_\_

LEGEND...  
UPSWEEP \_\_\_\_\_  
DOWNSWEEP - - - - -



DOUGLAS AIRCRAFT COMPANY, INC.

# SINUSOIDAL FREQUENCY SWEEP SIV-B SOUND PRESSURE LEVEL XDUCCERS (W36 + W36A)

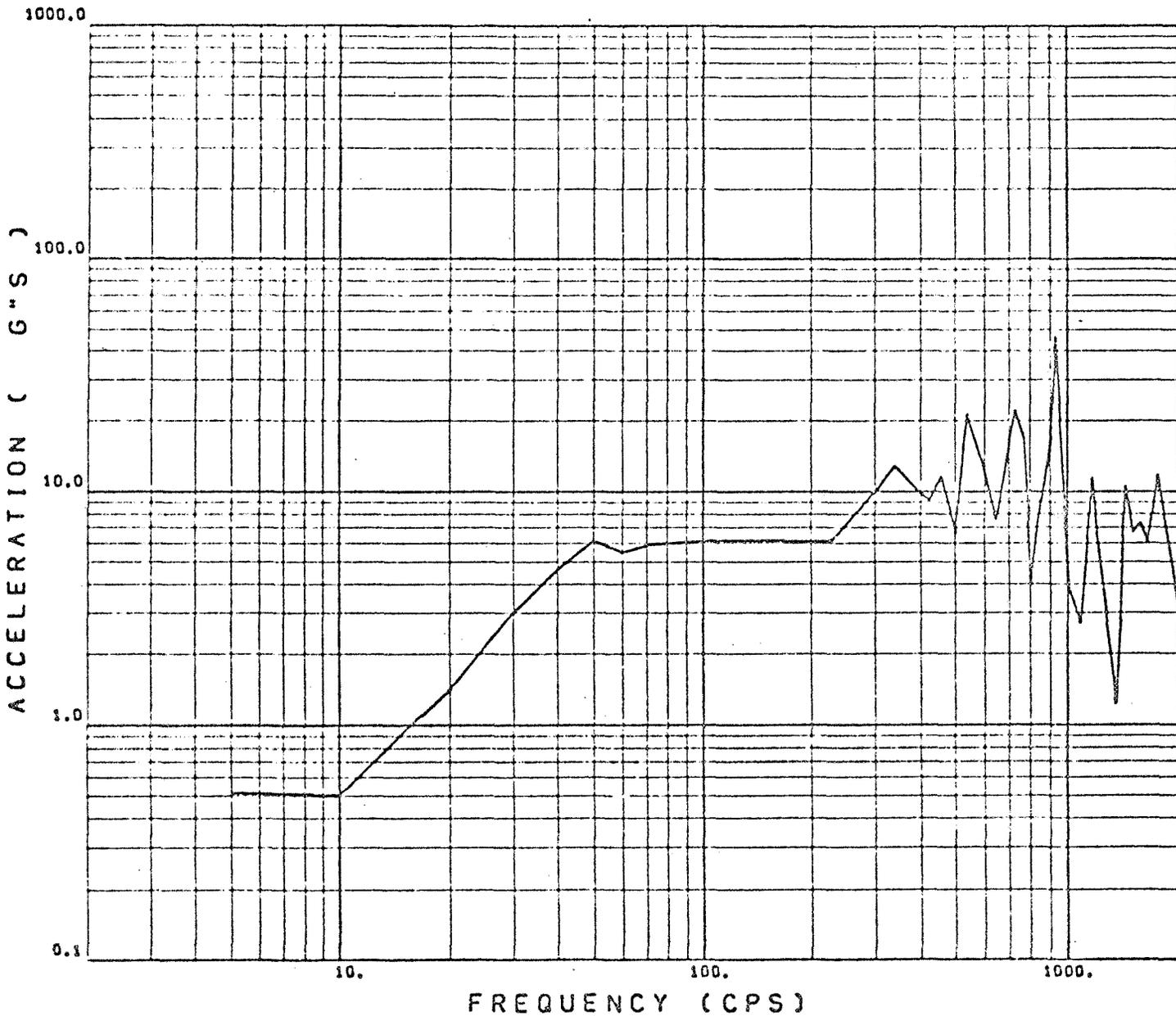
PAGE NO. A20  
REPORT NO. R3487-1

CONFIGURATION ---  
NOTE... SEE PAGE 81  
FOR PICK UP LOCATION

TEST CONDITIONS....

TEST DATE..... 3/03/66  
AXIS OF EXCITATION... C SPEC. 1  
PICK UP NUMBER ( 2)... HB94  
PICK UP RESPONSE..... C  
INPUT ACCEL. PER PAGE.. A19

LEGEND...  
UPSWEEP ———  
DOWNSWEEP - - - - -



DOUGLAS AIRCRAFT COMPANY, INC.

PAGE NO. A21  
REPORT NO. R5487-1

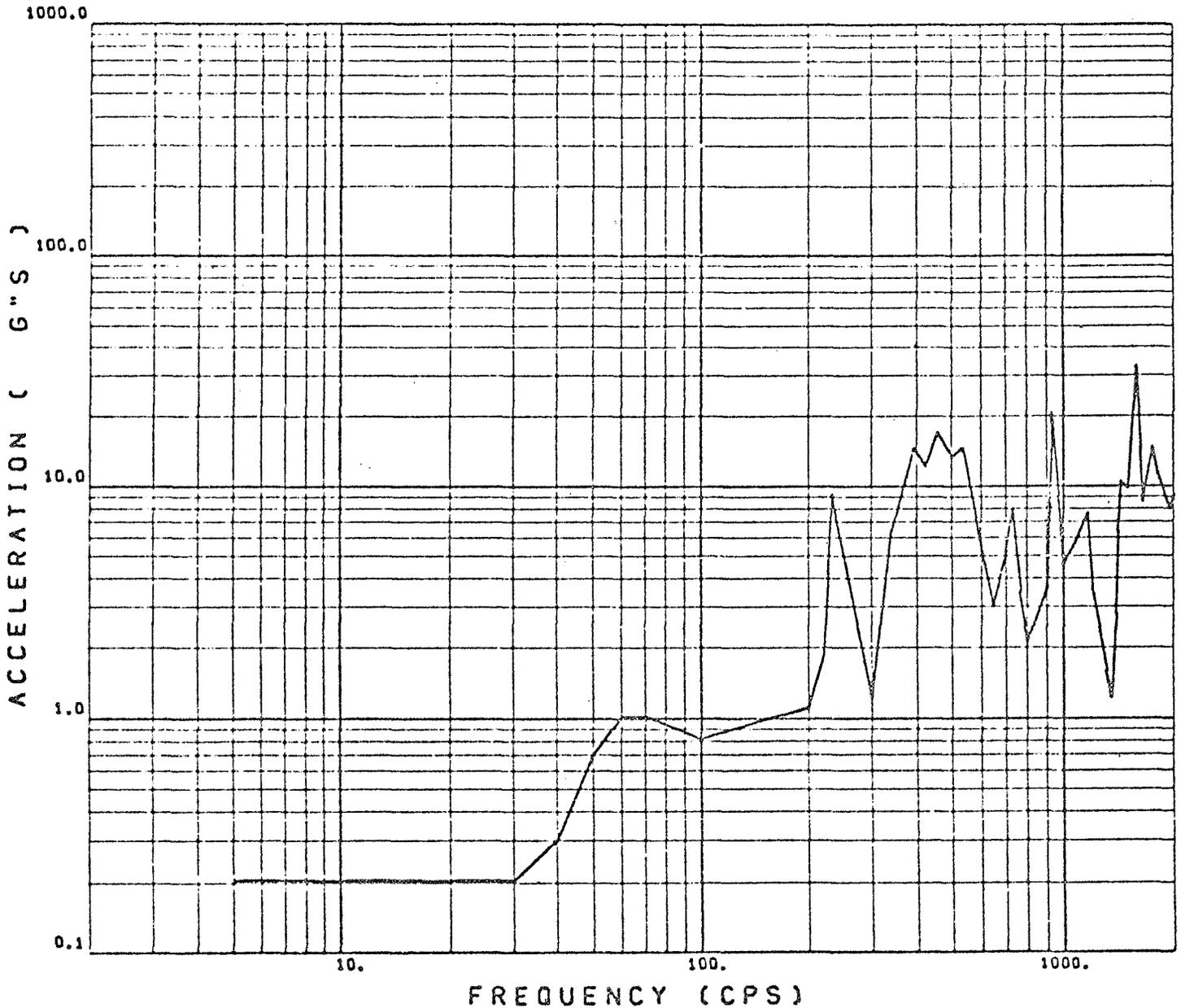
# SINUSOIDAL FREQUENCY SWEEP SIV-B SOUND PRESSURE LEVEL XDUCCERS (W36 + W36A)

CONFIGURATION ---  
NOTE... SEE PAGE B1  
FOR PICK UP LOCATION

LEGEND...  
UPSWEEP ———  
DOWNSWEEP - - - - -

TEST CONDITIONS....

TEST DATE..... 3/03/66  
AXIS OF EXCITATION... C SPEC. 1  
PICK UP NUMBER (3)... HA14  
PICK UP RESPONSE..... A  
INPUT ACCEL. PER PAGE.. A19



DOUGLAS AIRCRAFT COMPANY, INC.

PAGE NO. A22  
REPORT NO. R5487-1

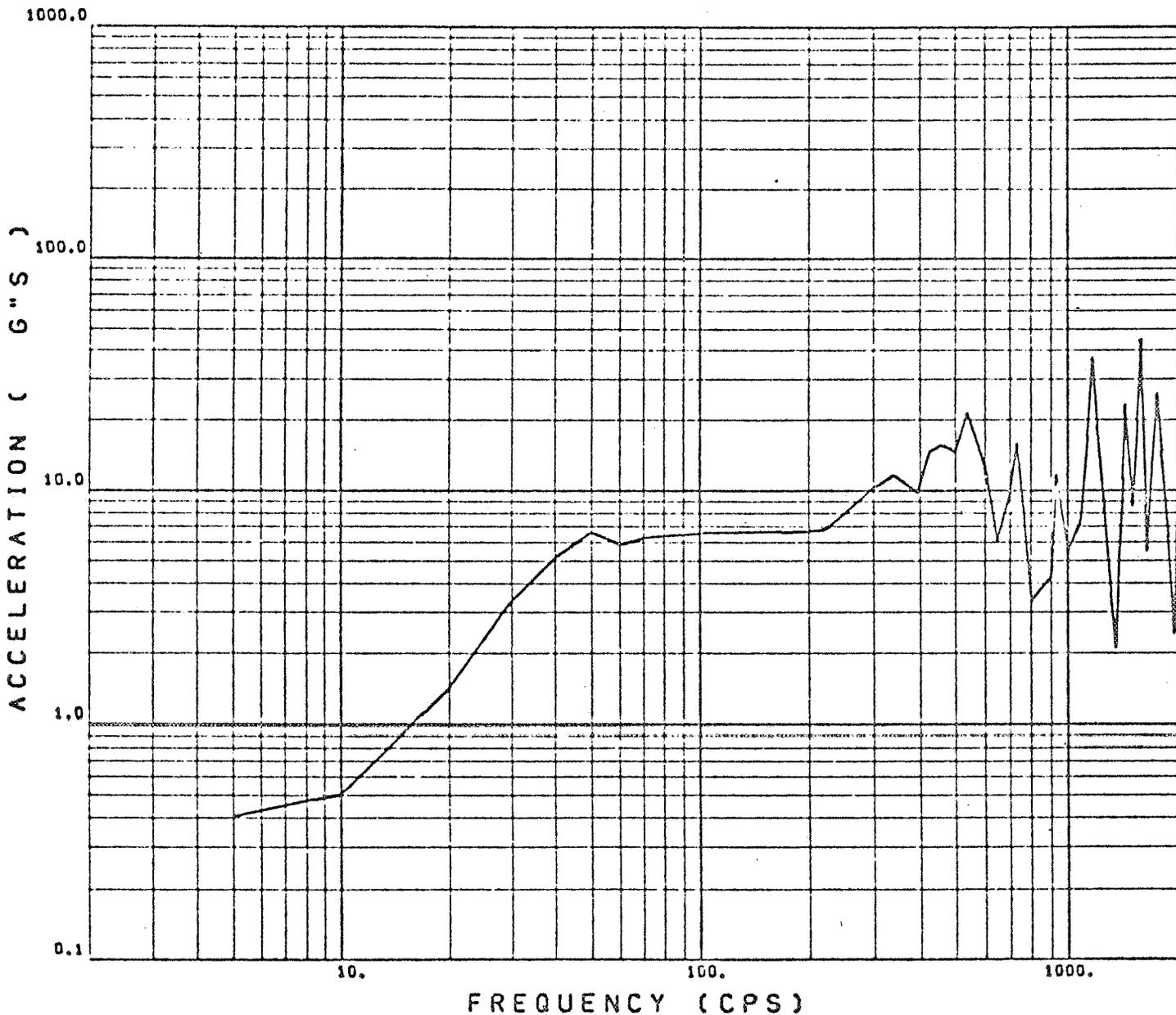
# SINUSOIDAL FREQUENCY SWEEP SIV-B SOUND PRESSURE LEVEL XDUCCERS (W36 + W36A)

CONFIGURATION ---  
NOTE... SEE PAGE B1  
FOR PICK UP LOCATION

TEST CONDITIONS....

TEST DATE..... 3/03/66  
AXIS OF EXCITATION.... C SPEC. 1  
PICK UP NUMBER ( 4)... FAB7  
PICK UP RESPONSE..... C  
INPUT ACCEL. PER PAGE.. A19

LEGEND...  
UPSWEEP ———  
DOWNSWEEP - - - - -



DOUGLAS AIRCRAFT COMPANY, INC.

# SINUSOIDAL FREQUENCY SWEEP SIY-B SOUND PRESSURE LEVEL XDUCCERS (W36 + W36A)

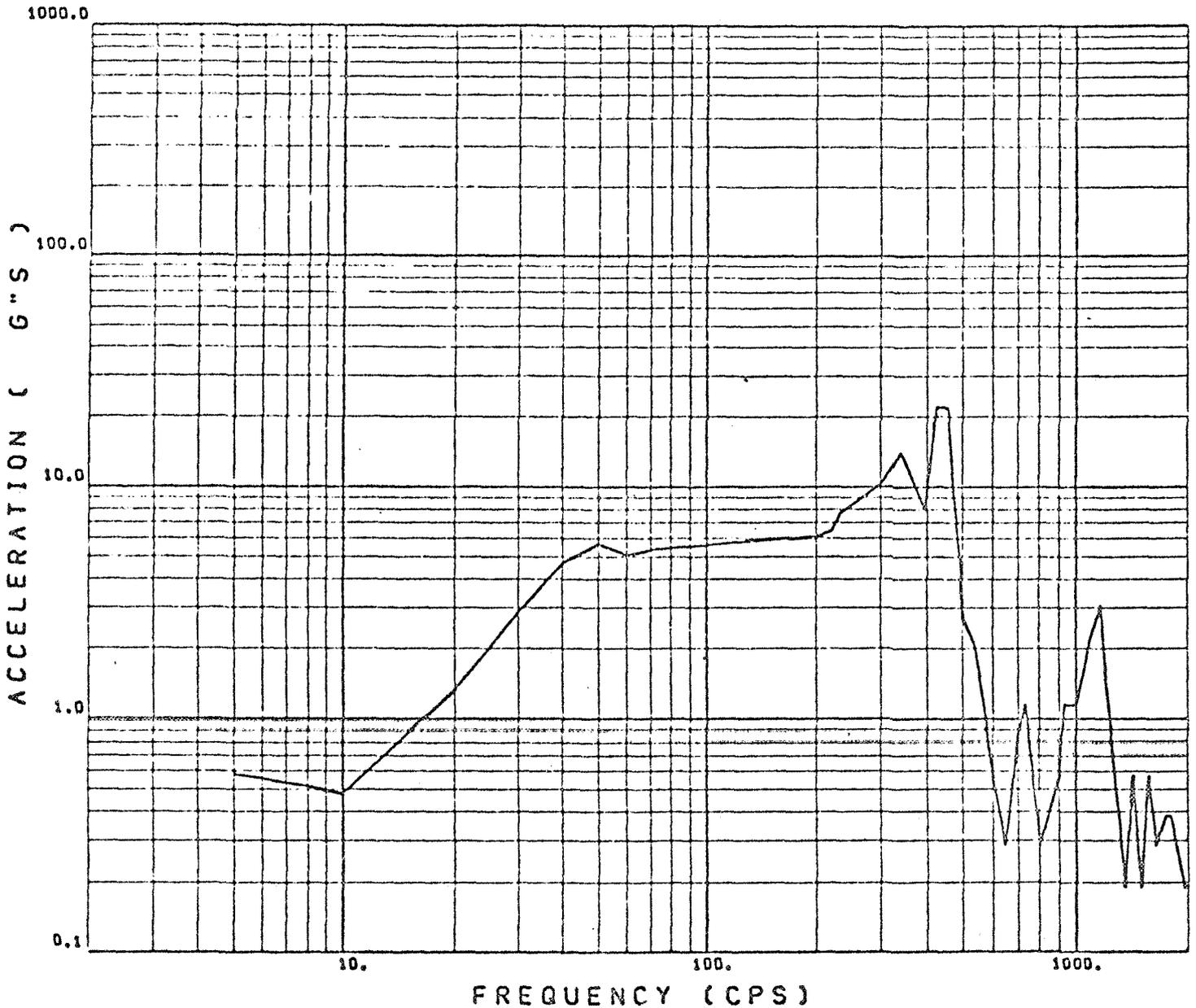
PAGE NO. A23  
REPORT NO. R5487-1

CONFIGURATION ---  
NOTE... SEE PAGE 81  
FOR PICK UP LOCATION

TEST CONDITIONS....

TEST DATE..... 3/03/66  
AXIS OF EXCITATION... C SPEC. 1  
PICK UP NUMBER ( 5)... LB14  
PICK UP RESPONSE..... C  
INPUT ACCEL. PER PAGE.. A19

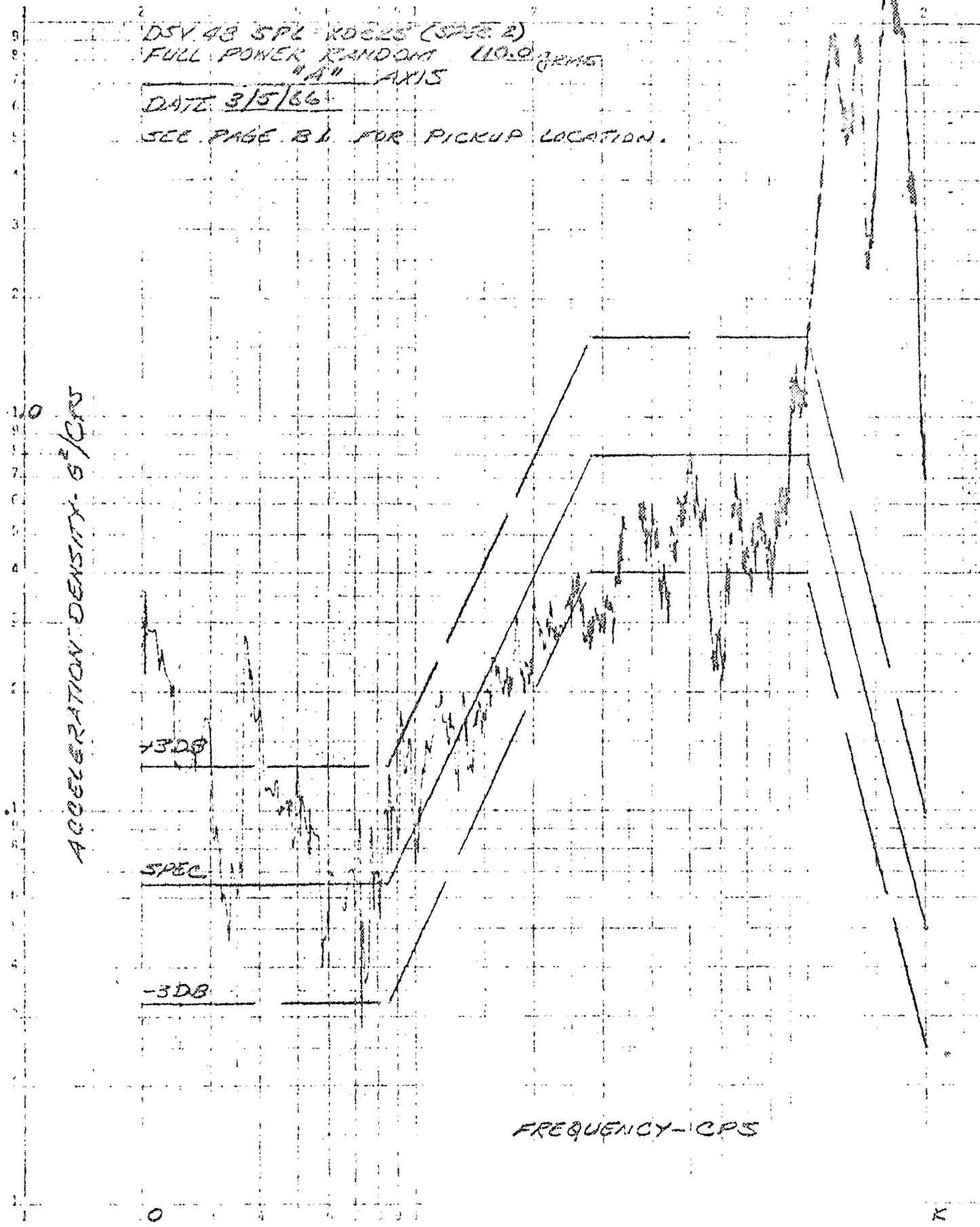
LEGEND...  
UPSWEEP ———  
DOWNSWEEP - - - - -



DSV 48 SPL 10000 (SPEC 2)  
FULL POWER RANDOM 119.0 (RMS)  
"A" AXIS

DATE 3/5/66

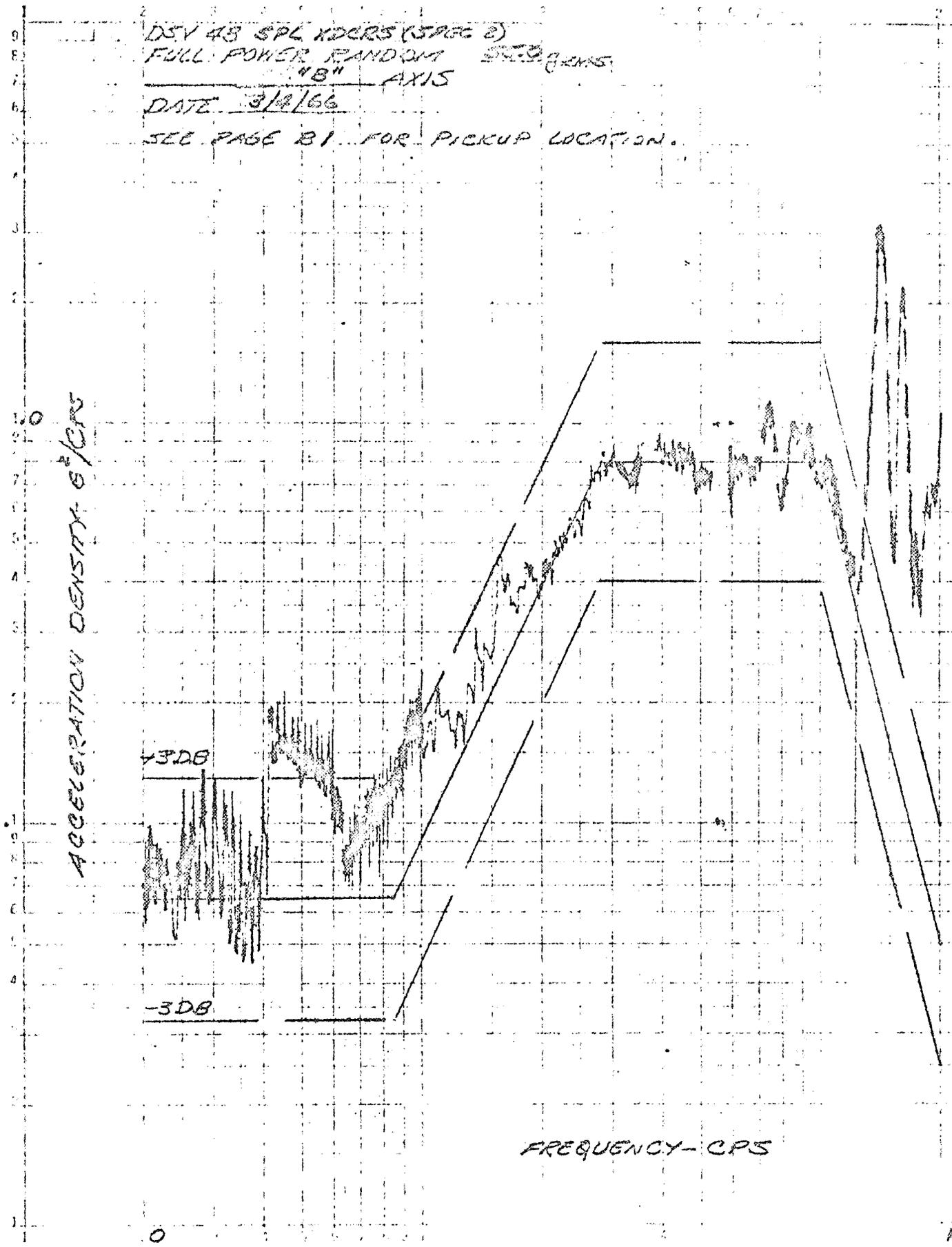
SEE PAGE B1 FOR PICKUP LOCATION.



DSV 48 SPL XDCRS (PAGE 2)  
FULL POWER RANDOM STRENGTHS  
"4B" AXIS

DATE 3/10/66

SEE PAGE B1 FOR PICKUP LOCATION.



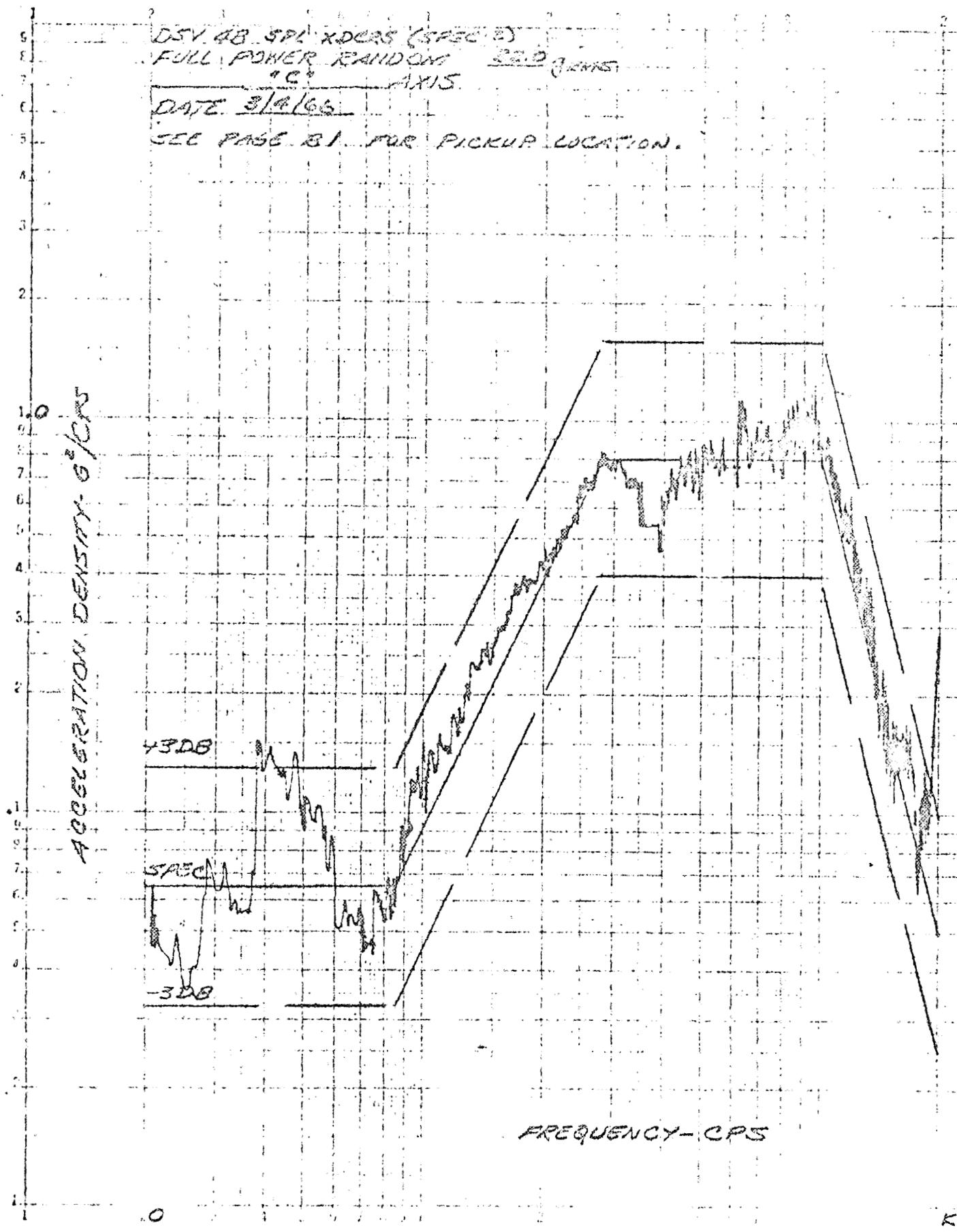
0

K

DSV 48 SPL XDCRS (SPEC B)  
FULL POWER RANDOM 320 GMS  
"C" AXIS

DATE 3/9/66

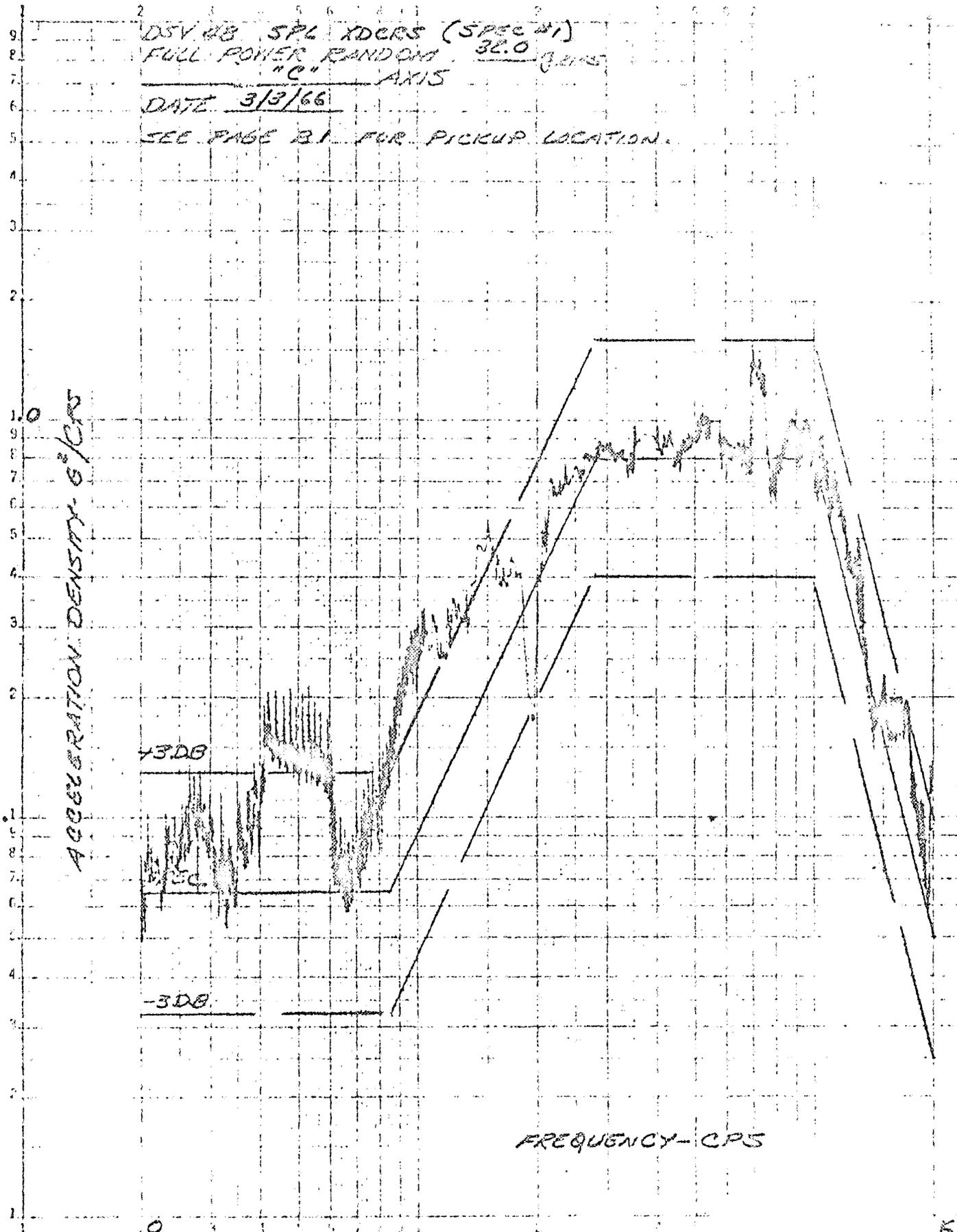
SEE PAGE 81 FOR PICKUP LOCATION.



DSV #8 SPL XDCRS (SPEC #1)  
FULL POWER RANDOM 32.0  
"C" AXIS

DATE 3/3/66

SEE PAGE B1 FOR PICKUP LOCATION.



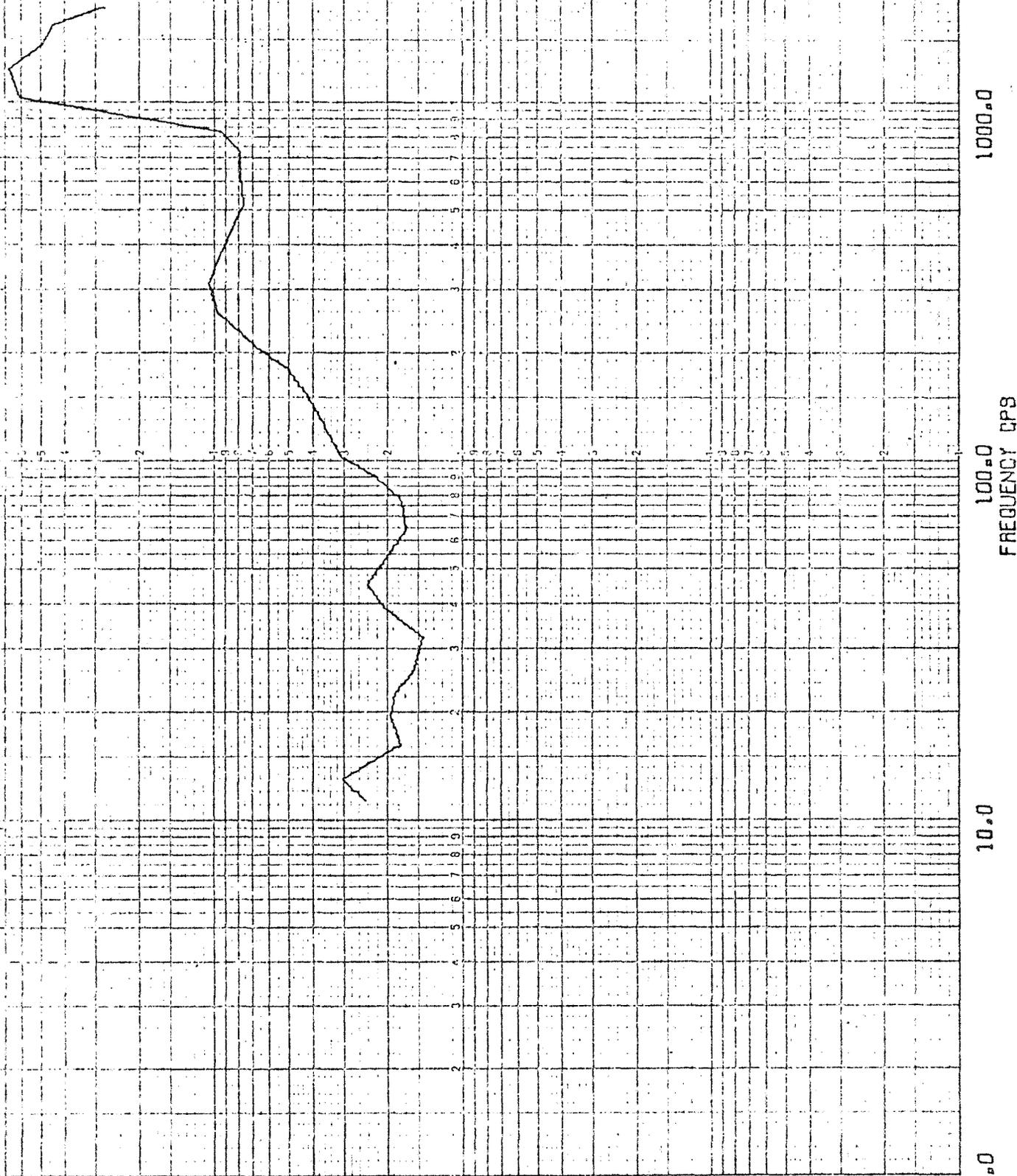
OSV-48 RANDOM VIBRATION TEST  
SOUND PRESSURE LEVELS, TRANSDUCER W36/NDCA

CONFIGURATION  
P/N

TEST CONDITIONS

NOTE  
SEE PAGE B1 FOR  
PICK-UP LOCATION

TEST DATE: 3-5-66  
AXIS OF EXCITATION: R  
PICK-UP NUMBER: 1  
PICK-UP RESPONSE: \_\_\_\_\_  
INPUT ACCELERATION PER PAGE: \_\_\_\_\_  
RMS VALUE: 12.0



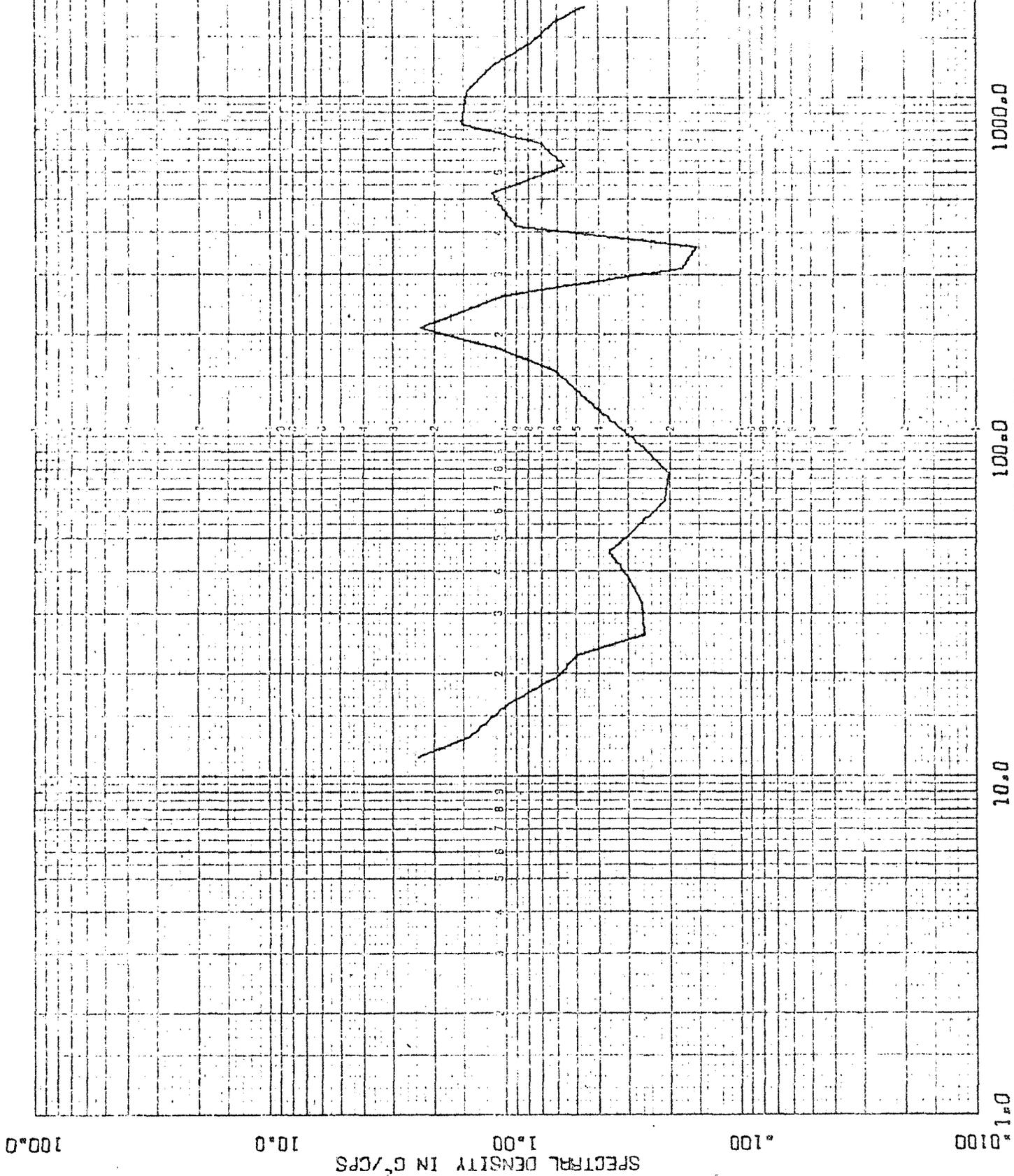
DSV-4B RANDOM VIBRATION TEST  
SOUND PRESSURE LEVELS TRANSDUCER W36/W30A

CONFIGURATION  
P/N

TEST CONDITIONS

NOTE  
SEE PAGE 81 FOR  
PICK-UP LOCATION

TEST DATE 3-5-65  
AXIS OF EXCITATION H  
PICK-UP NUMBER 2  
PICK-UP RESPONSE A  
INPUT ACCELERATION PER PAGE A28  
RMS VALUE



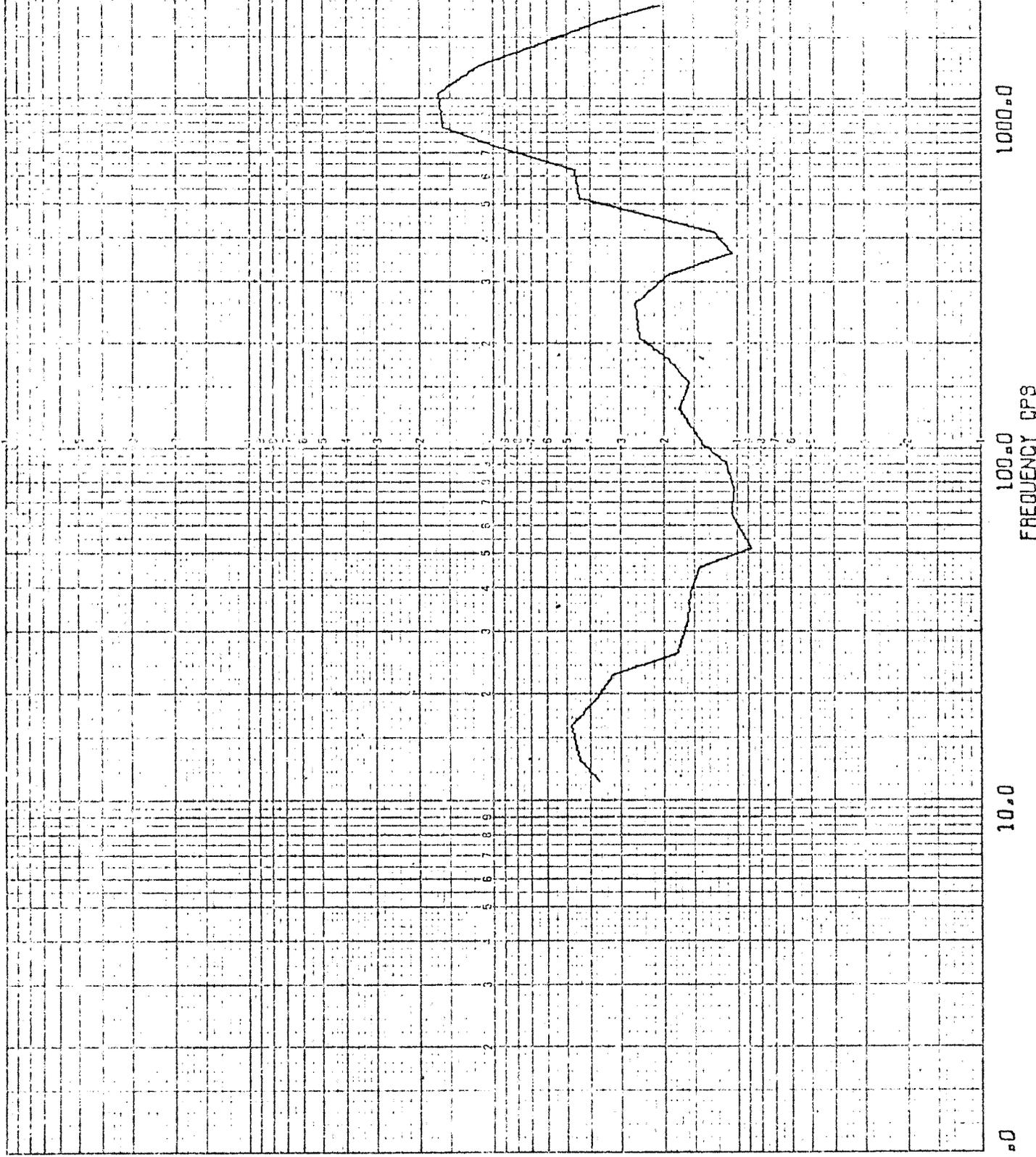
OSV-4B RANDOM VIBRATION TEST  
SOUND PRESSURE LEVELS TRANSDUCER U36/U36A

CONFIGURATION

P/N  
NOTE  
SEE PAGE B1 FOR  
PICK-UP LOCATION

TEST CONDITIONS

TEST DATE 3-5-66  
AXIS OF EXCITATION A  
PICK-UP NUMBER 3  
PICK-UP RESPONSE C  
INPUT ACCELERATION PER PAGE 1.428  
RMS VALUE 21.0



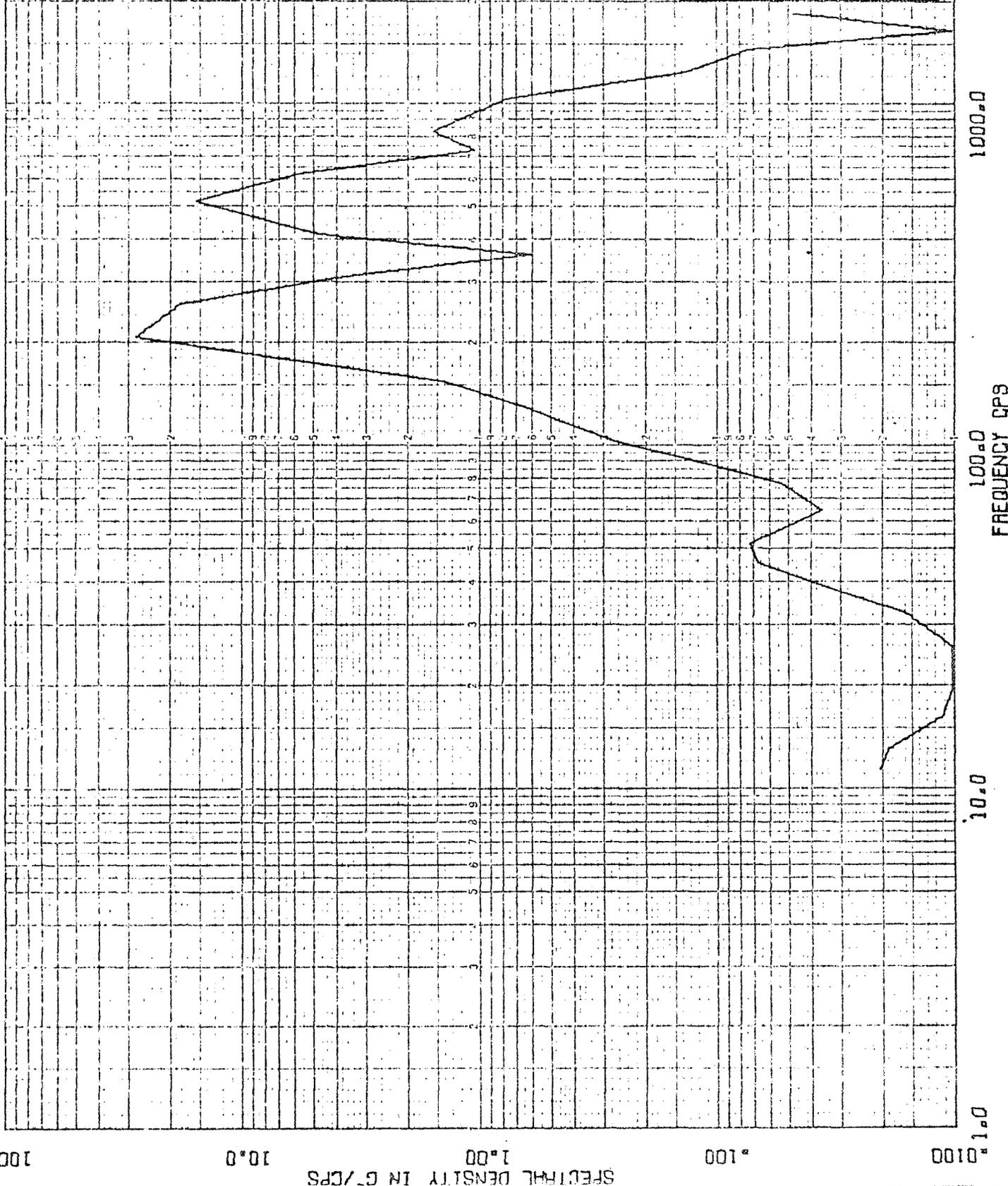
DSV-4B RANDOM VIBRATION TEST  
SOUND PRESSURE LEVELS TRANSDUCER W36/W30A

CONFIGURATION  
P/N

TEST CONDITIONS

TEST DATE 3-5-65  
AXIS OF EXCITATION B  
PICK-UP NUMBER 5  
PICK-UP RESPONSE A  
INPUT ACCELERATION PER PAGE 125  
RMS VALUE 17.5

NOTE:  
SEE PAGE B1 FOR  
PICK-UP LOCATION



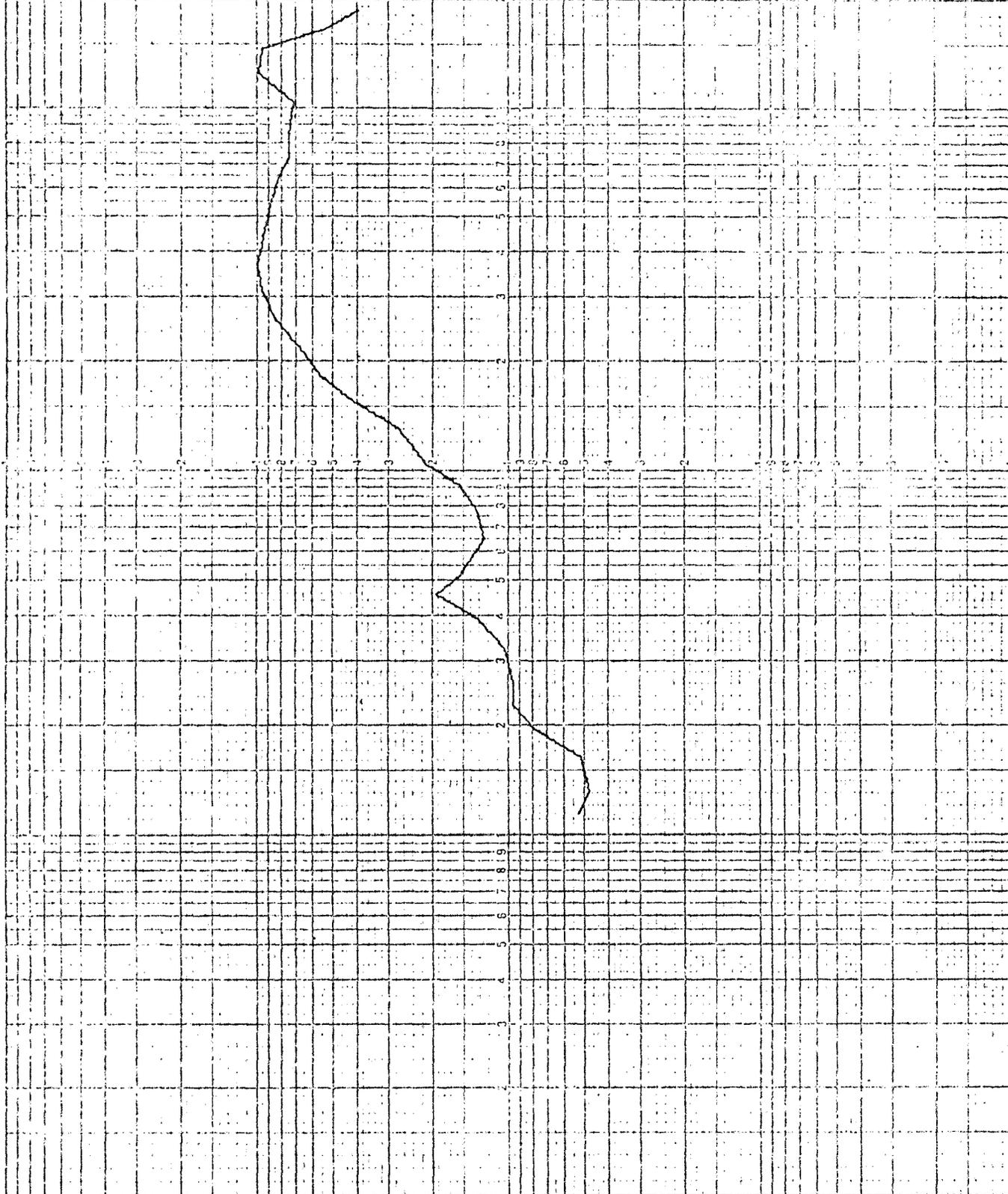
DSV-48 RANDOM VIBRATION TEST

TRANSDUCER, SOUND PRESSURE LEVEL, SPECIMEN 2 (W-36)/W36A

CONFIGURATION  
P/N: 1A6870B-1

TEST CONDITIONS  
TEST DATE: 3/4/56  
AXIS OF EXCITATION: 8  
PICK-UP NUMBER: 1 CONTROL  
PICK-UP RESPONSE:  
INPUT ACCELERATION PER PAGE:  
RMS VALUE: 42.2

NOTE  
SEE PAGE 81 FOR  
PICK-UP LOCATION



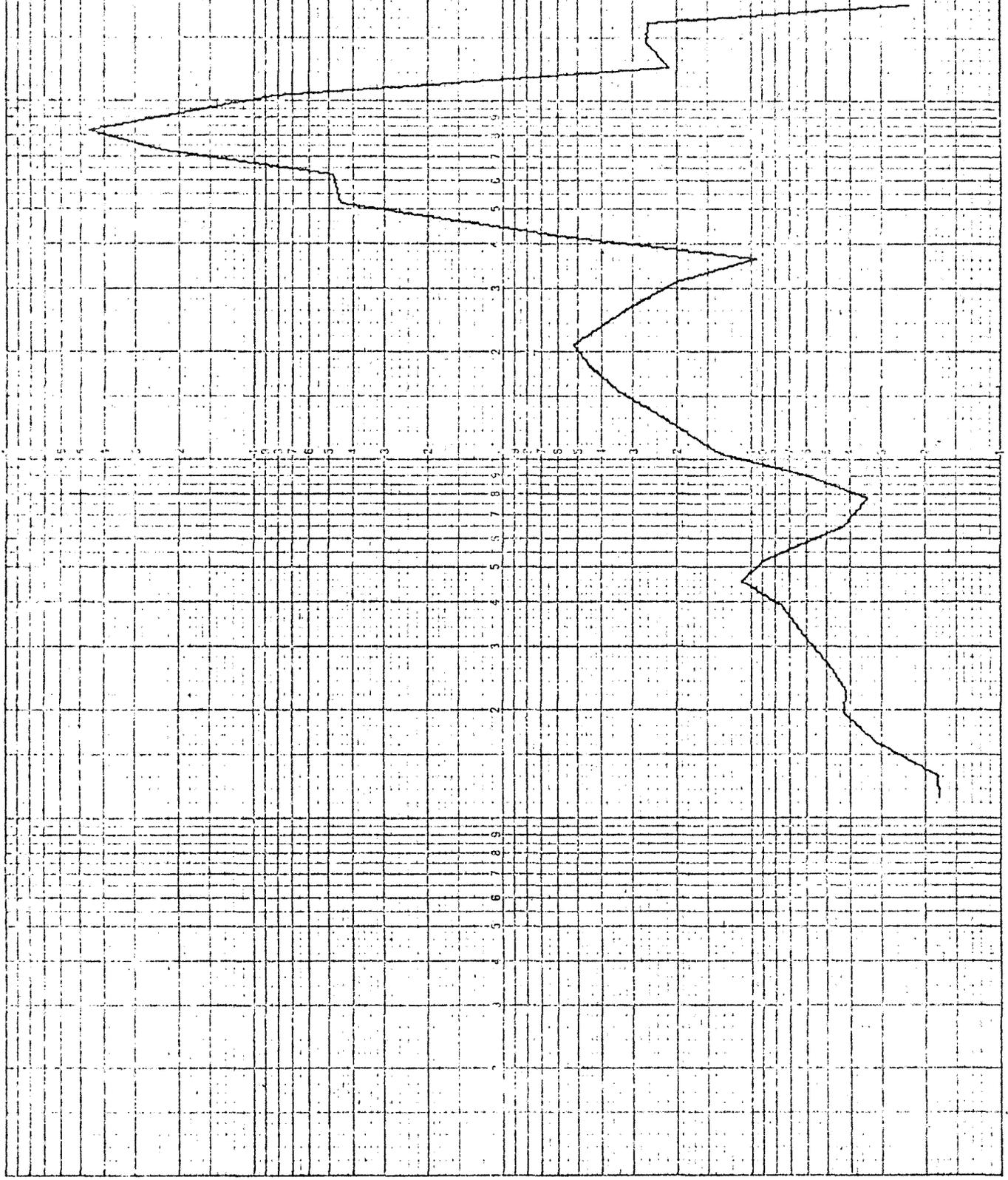
OSV-48 RANDOM VIBRATION TEST

TRANSDUCER, SOUND PRESSURE LEVEL, SPECIMEN 2 (U-36) / W36A

CONFIGURATION  
P/N 1868708-1

TEST CONDITIONS	
TEST DATE	3/4/66
AXIS OF EXCITATION	B
PICK-UP NUMBER	2
PICK-UP RESPONSE	B
INPUT ACCELERATION PER PAGE	1.5g
RMS VALUE	116.9

NOTE  
SEE PAGE 81 FOR  
PICK-UP LOCATION



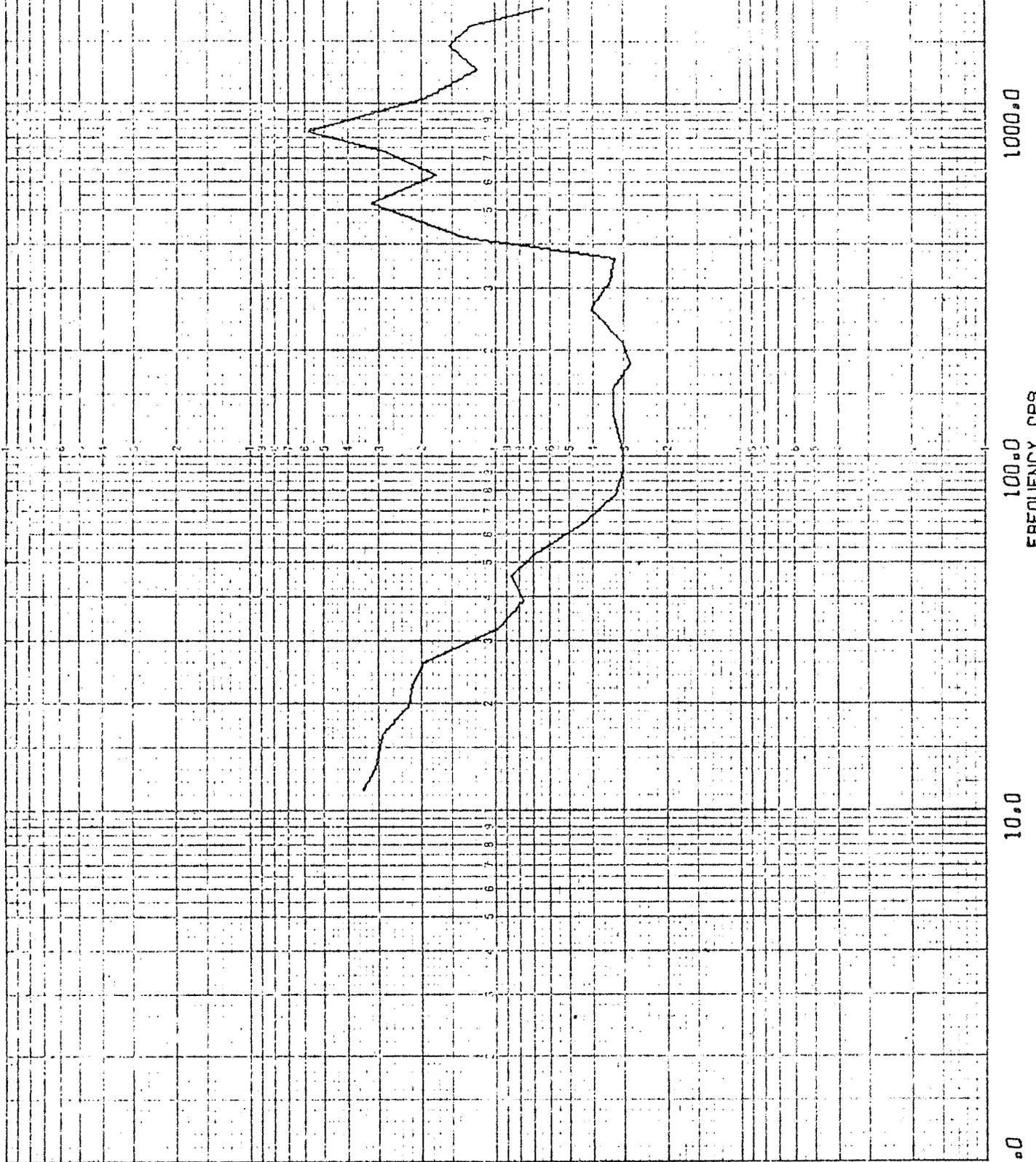
OSV-4B RANDOM VIBRATION TEST

TRANSDUCER: SOUND PRESSURE LEVEL; SPECIMEN 2 (U-36) / 1036A

CONFIGURATION  
P/N: 1R68708-1

TEST CONDITIONS  
TEST DATE: 3/4/66  
AXIS OF EXCITATION: B  
PICK-UP NUMBER: 3  
PICK-UP RESPONSE: C  
INPUT ACCELERATION PER PAGE: 1.32  
RMS VALUE: 67.2

NOTE  
SEE PAGE 81 FOR  
PICK-UP LOCATION



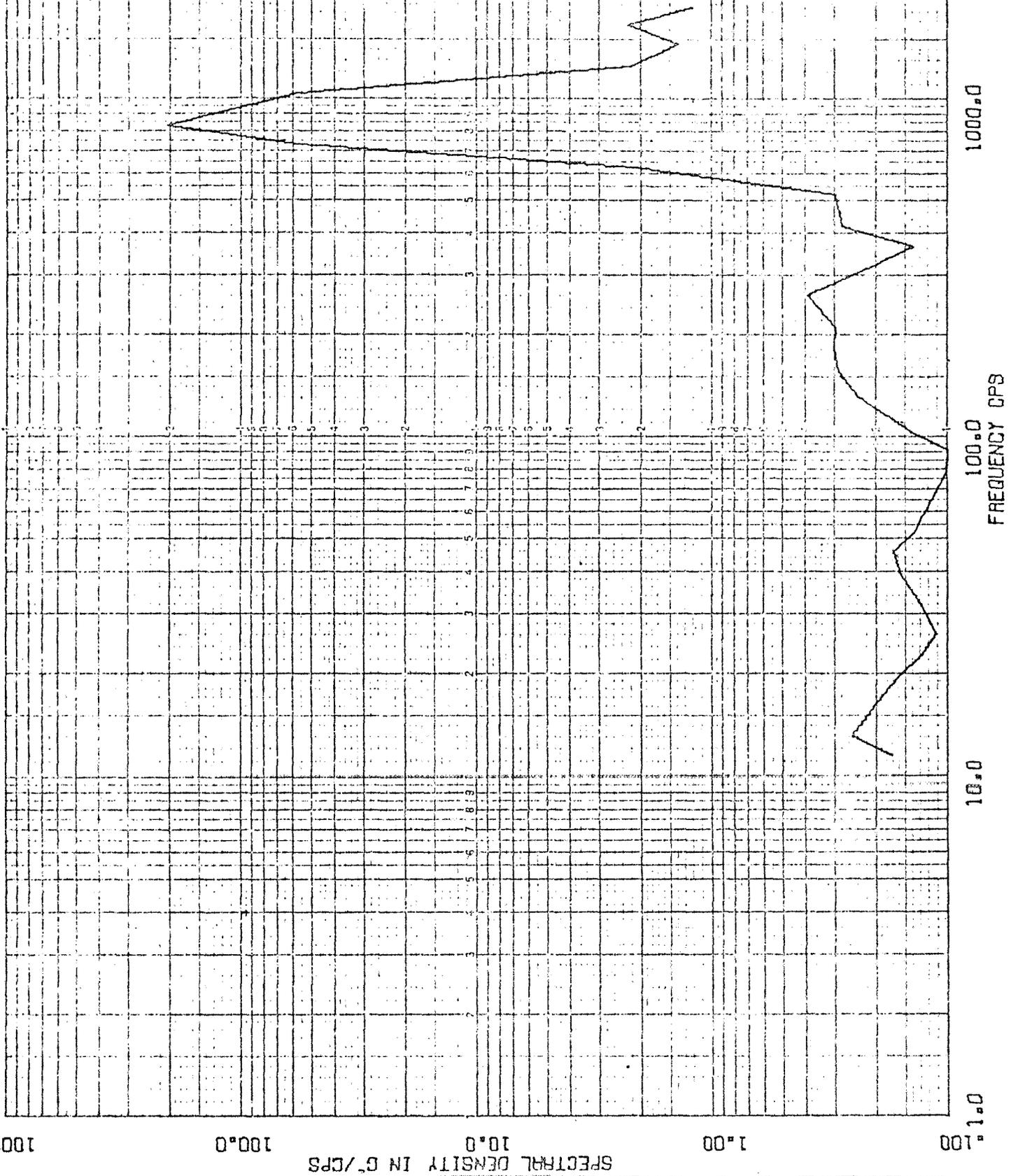
DSV-48 RANDOM VIBRATION TEST

TRANSDUCER, SOUND PRESSURE LEVEL, SPECIMEN 2 (M-36) / W-36A

CONFIGURATION  
P/N 1A68708-1

TEST CONDITIONS	
TEST DATE	3/ 4/65
AXIS OF EXCITATION	B
PICK-UP NUMBER	4
PICK-UP RESPONSE	2
INPUT ACCELERATION PER PAGE	1.5
RMS VALUE	236.2

NOTE  
SEE PAGE 31 FOR  
PICK-UP LOCATION



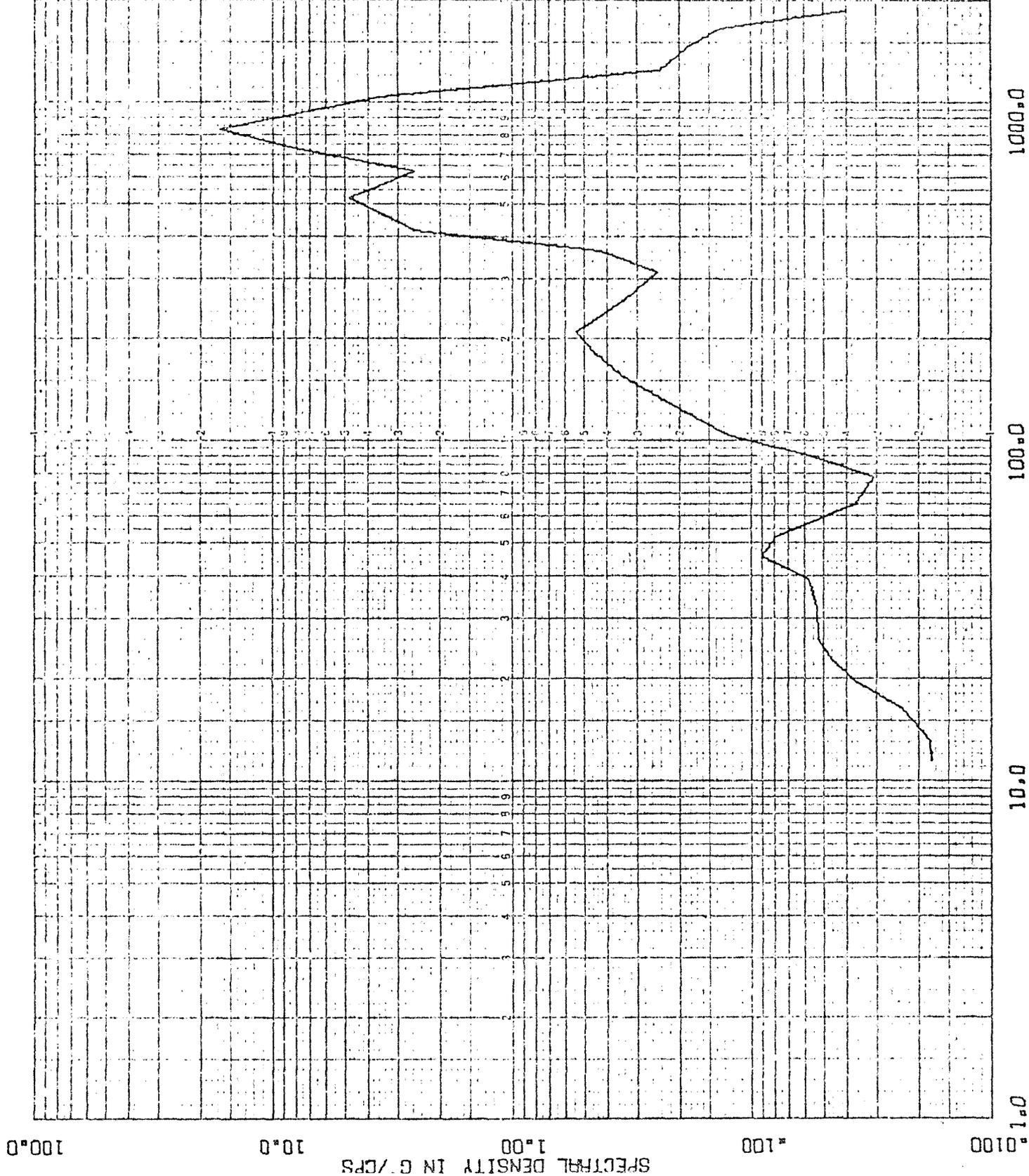
DSV-48 RANDOM VIBRATION TEST

TRANSDUCER, SOUND PRESSURE LEVEL, SPECIMEN 2-14-361 / W36A

CONFIGURATION  
P/N 1A68708-1

TEST CONDITIONS	
TEST DATE	3/4/66
AXIS OF EXCITATION	8
PICK-UP NUMBER	5
PICK-UP RESPONSE	8
INPUT ACCELERATION PER PAGE	133
RMS VALUE	76.4

NOTE  
SEE PAGE 81 FOR  
PICK-UP LOCATION



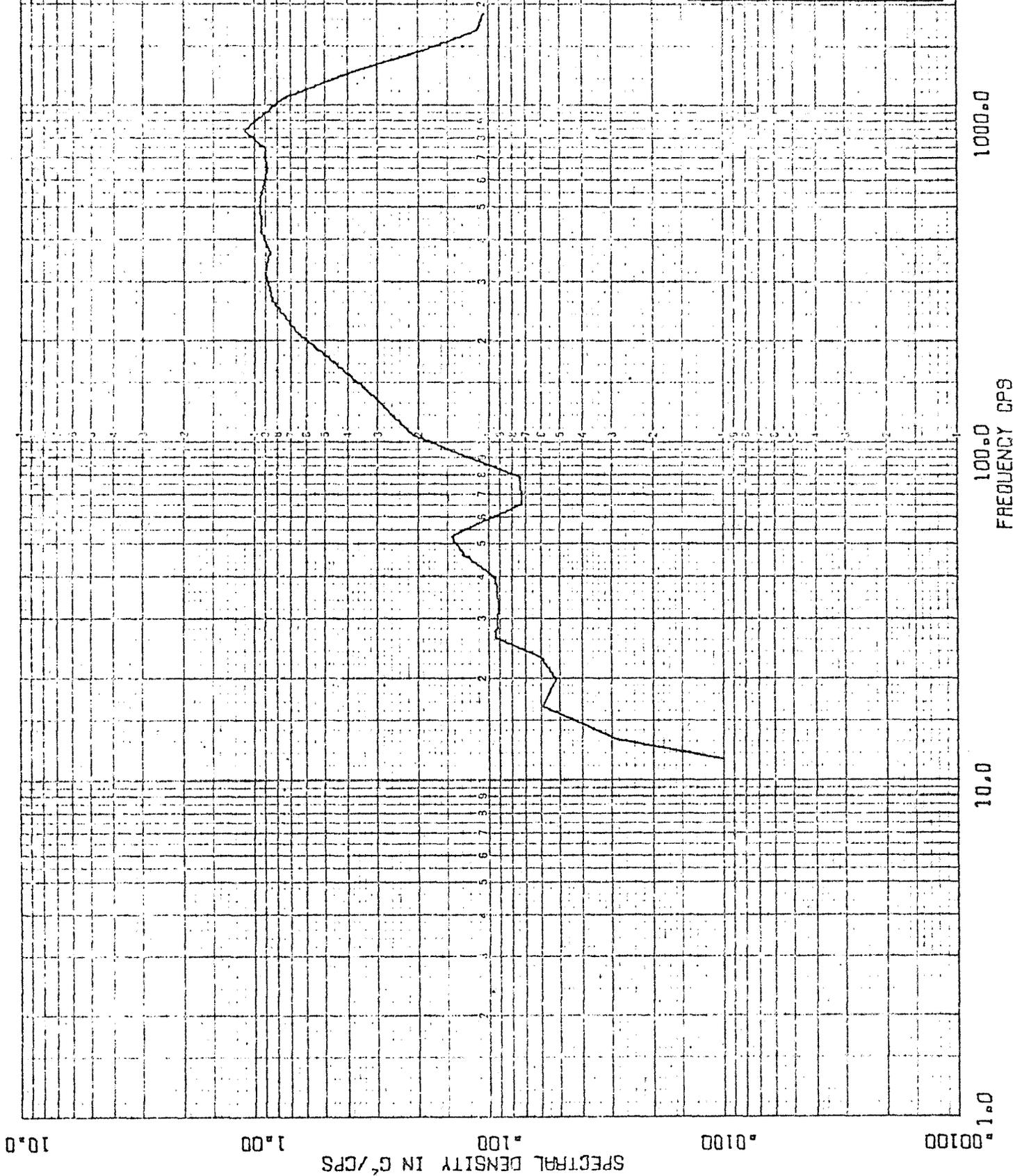
DSV-48 RANDOM VIBRATION TEST

TRANSDUCER SOUND PRESSURE LEVELS SPECIMEN 2 (U36/U36A)

CONFIGURATION -  
P/N 1A68708-

TEST CONDITIONS  
TEST DATE 3-4-66  
AXIS OF EXCITATION 0  
PICK-UP NUMBER 1  
PICK-UP RESPONSE  
INPUT ACCELERATION PER PAGE  
RMS VALUE 39.1

NOTE  
SEE PAGE 81 FOR  
PICK-UP LOCATION



DSV-40 RANDOM VIBRATION TEST

TRANSDUCER - SOUND PRESSURE LEVELS, SPECIMEN 2 (U36/U36R)

CONFIGURATION

P/N 1R68708-

TEST CONDITIONS

TEST DATE 3-4-66

AXIS OF EXCITATION 0

PICK-UP NUMBER 2

PICK-UP RESPONSE C

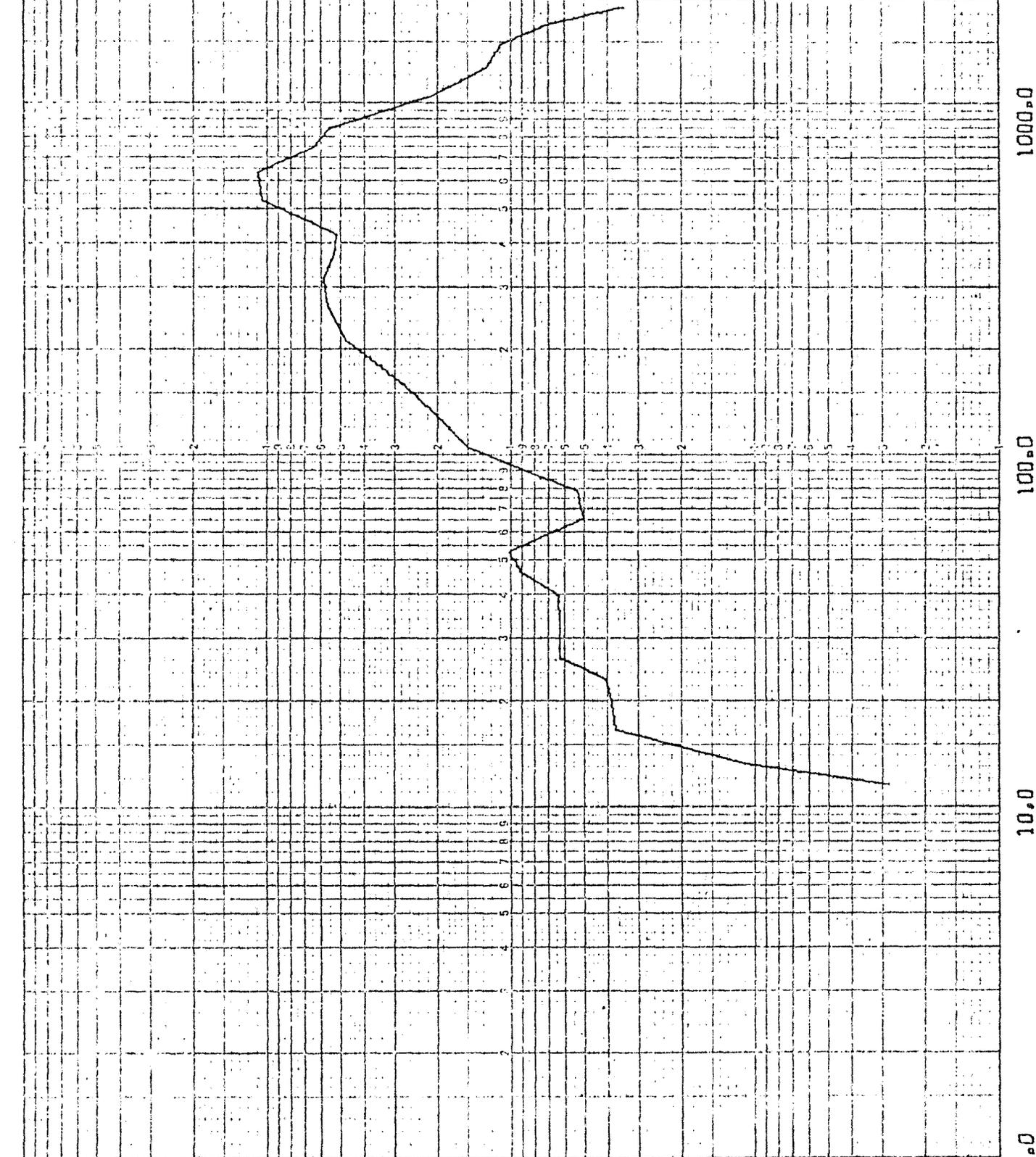
INPUT ACCELERATION PER PAGE 1.37

RMS VALUE 26.9

NOTE

SEE PAGE B1 FOR

PICK-UP LOCATION



DSV-40 RANDOM VIBRATION TEST

TRANSDUCER, SOUND PRESSURE LEVELS, SPECIMEN 2 (U36/U36R)

CONFIGURATION

P/N 1R68708-

TEST CONDITIONS

TEST DATE 3-4-66

AXIS OF EXCITATION 0

PICK-UP NUMBER 3

PICK-UP RESPONSE A

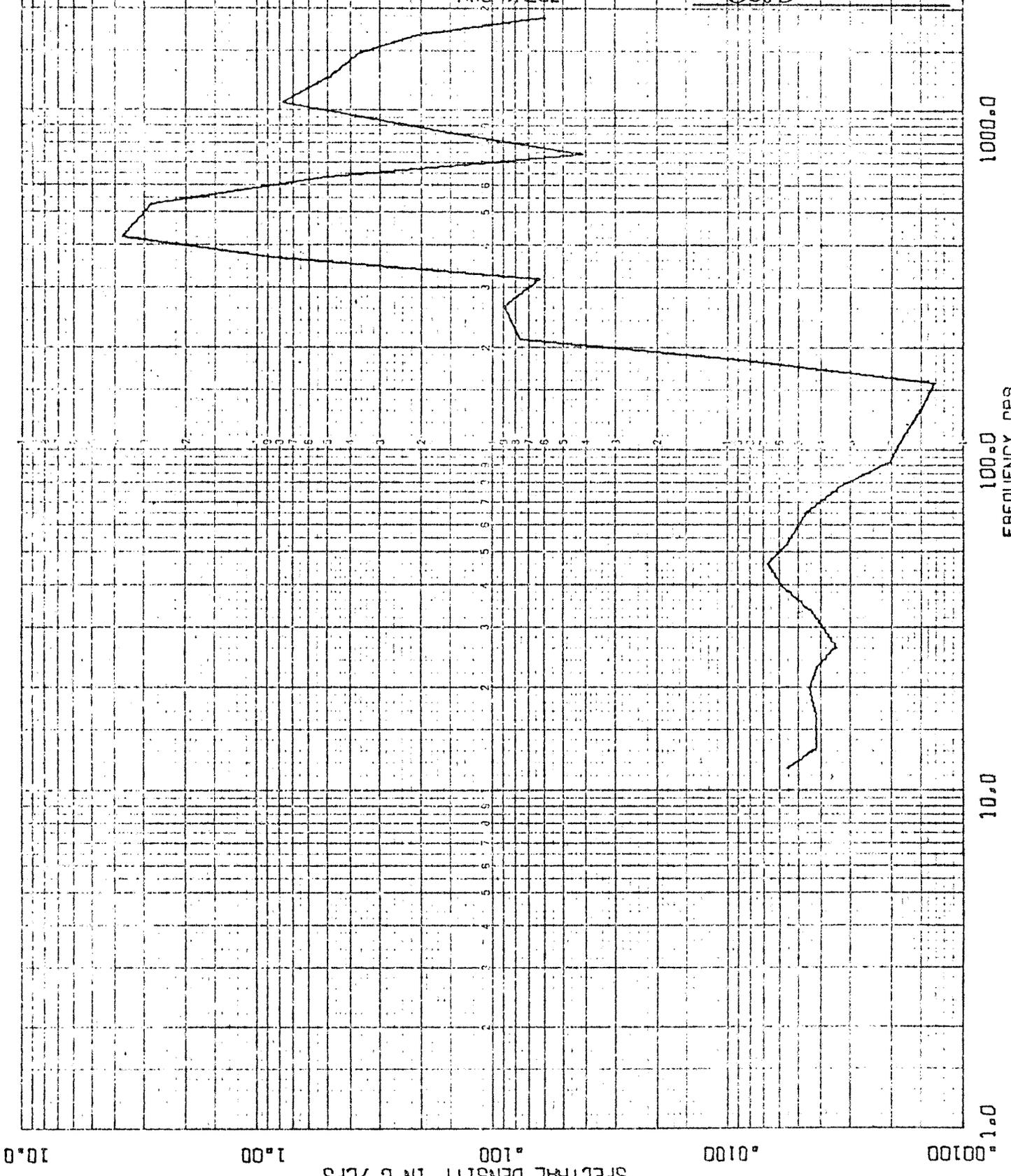
INPUT ACCELERATION PER PAGE 1.37

RMS VALUE 35.3

NOTE

SEE PAGE 81 FOR

PICK-UP LOCATION



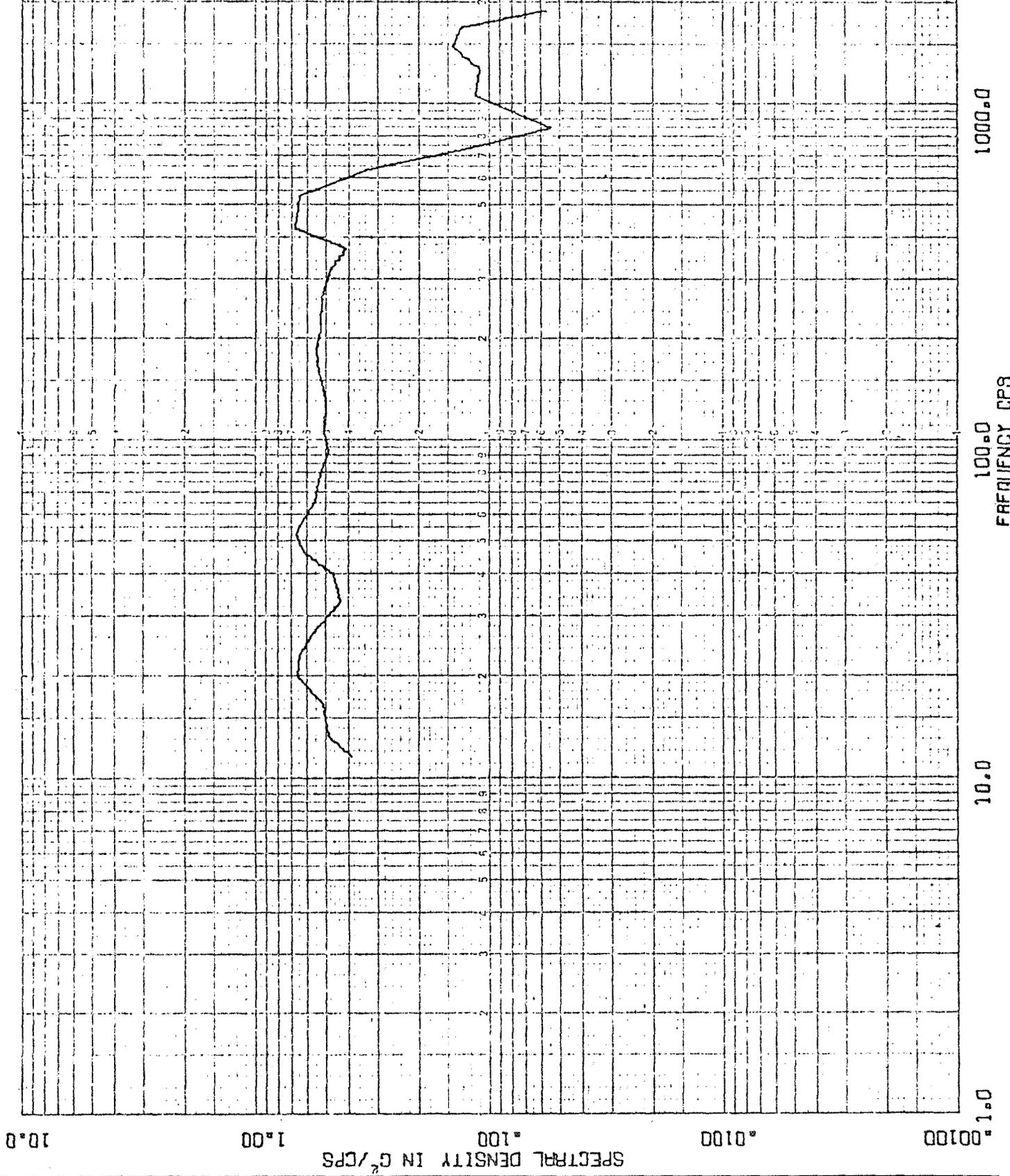
OSV-48 RANDOM VIBRATION TEST

TRANSDUCER SOUND PRESSURE LEVELS SPECIMEN 2 (U36/U36R)

CONFIGURATION  
P/N 1A68708-

TEST CONDITIONS  
TEST DATE 3-4-66  
AXIS OF EXCITATION C  
PICK-UP NUMBER 4  
PICK-UP RESPONSE C  
INPUT ACCELERATION PER PAGE 437  
RMS VALUE 23.2

NOTE  
SEE PAGE 81 FOR  
PICK-UP LOCATION



DSV-48 RANDOM VIBRATION TEST

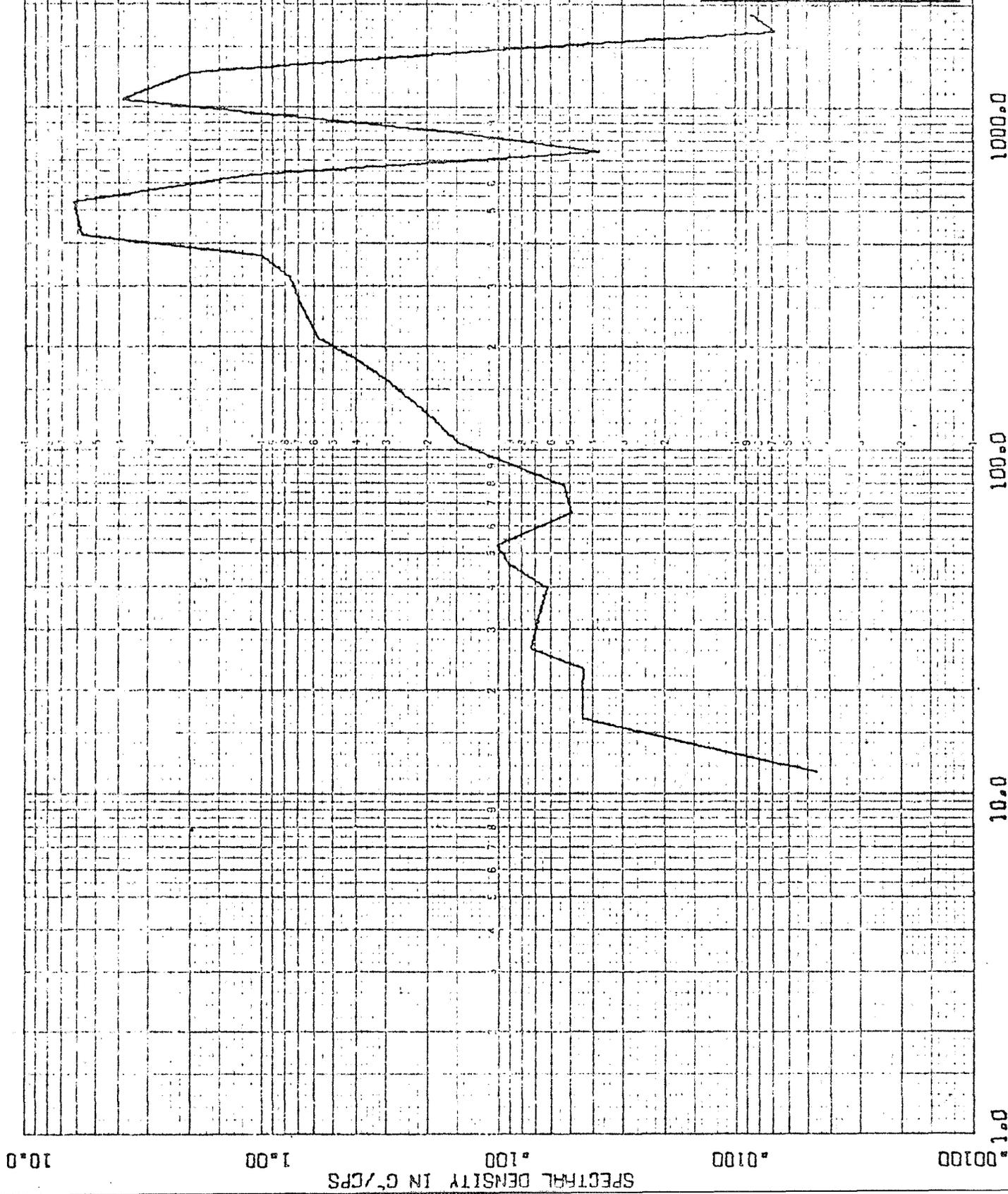
TRANSDUCER, SOUND PRESSURE LEVELS, SPECIMEN 2 (436/436R)

CONFIGURATION  
P/N 1R68708-

TEST CONDITIONS

TEST DATE 3-4-65  
AXIS OF EXCITATION C  
PICK-UP NUMBER 5  
PICK-UP RESPONSE C  
INPUT ACCELERATION PER PAGE 1.51  
RMS VALUE 55.1

NOTE  
SEE PAGE 61 FOR  
PICK-UP LOCATION



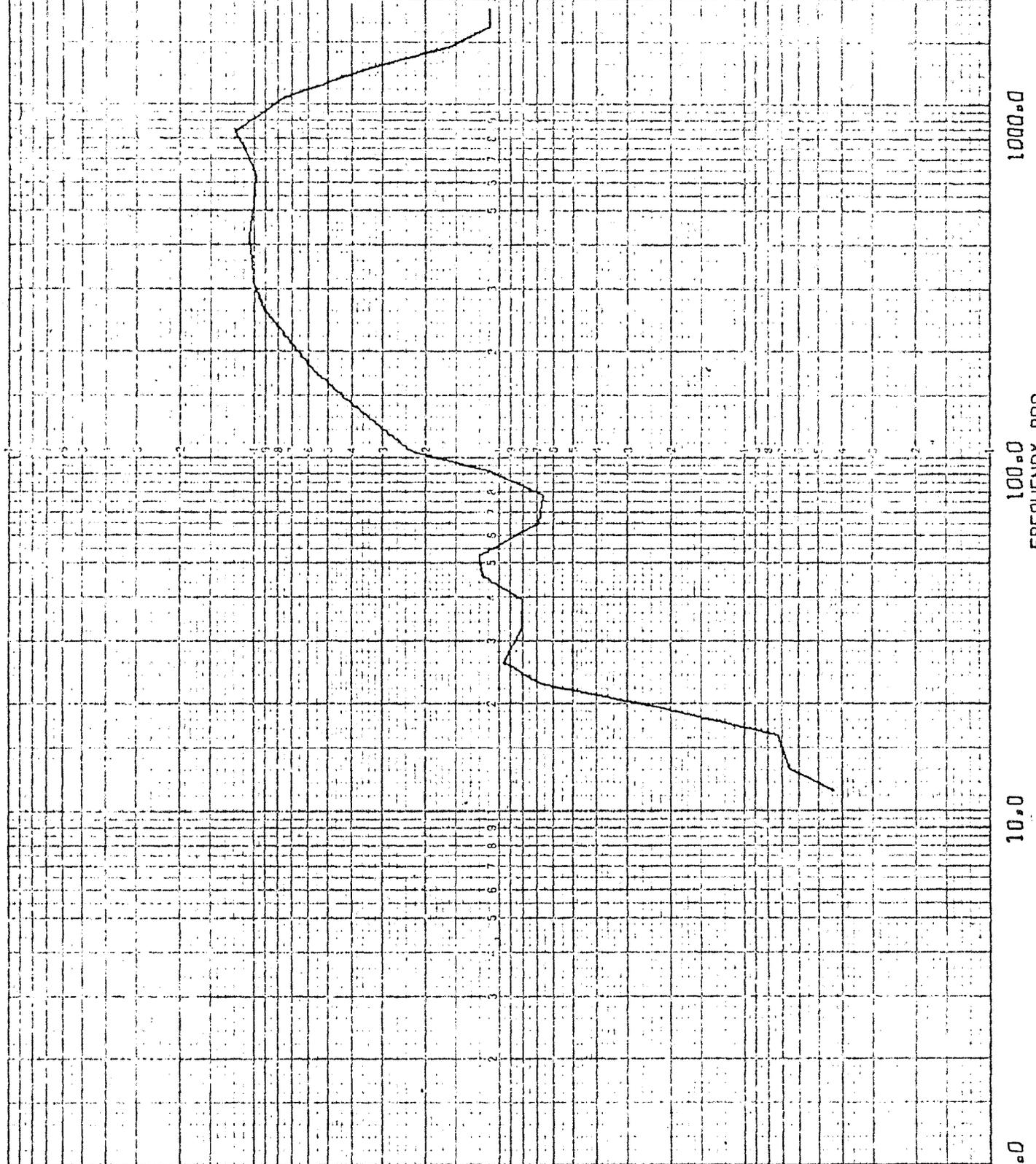
DSV-48 RANDOM VIBRATION TEST

TRANSDUCER, SOUND PRESSURE LEVELS, SPECIMEN 1 (U36/U36A)

CONFIGURATION  
P/N 1A68708-

TEST CONDITIONS  
TEST DATE 3-3-66  
AXIS OF EXCITATION C  
PICK-UP NUMBER 1  
PICK-UP RESPONSE  
INPUT ACCELERATION PER PAGE  
RMS VALUE 35.1

NOTE  
SEE PAGE 81 FOR  
PICK-UP LOCATION



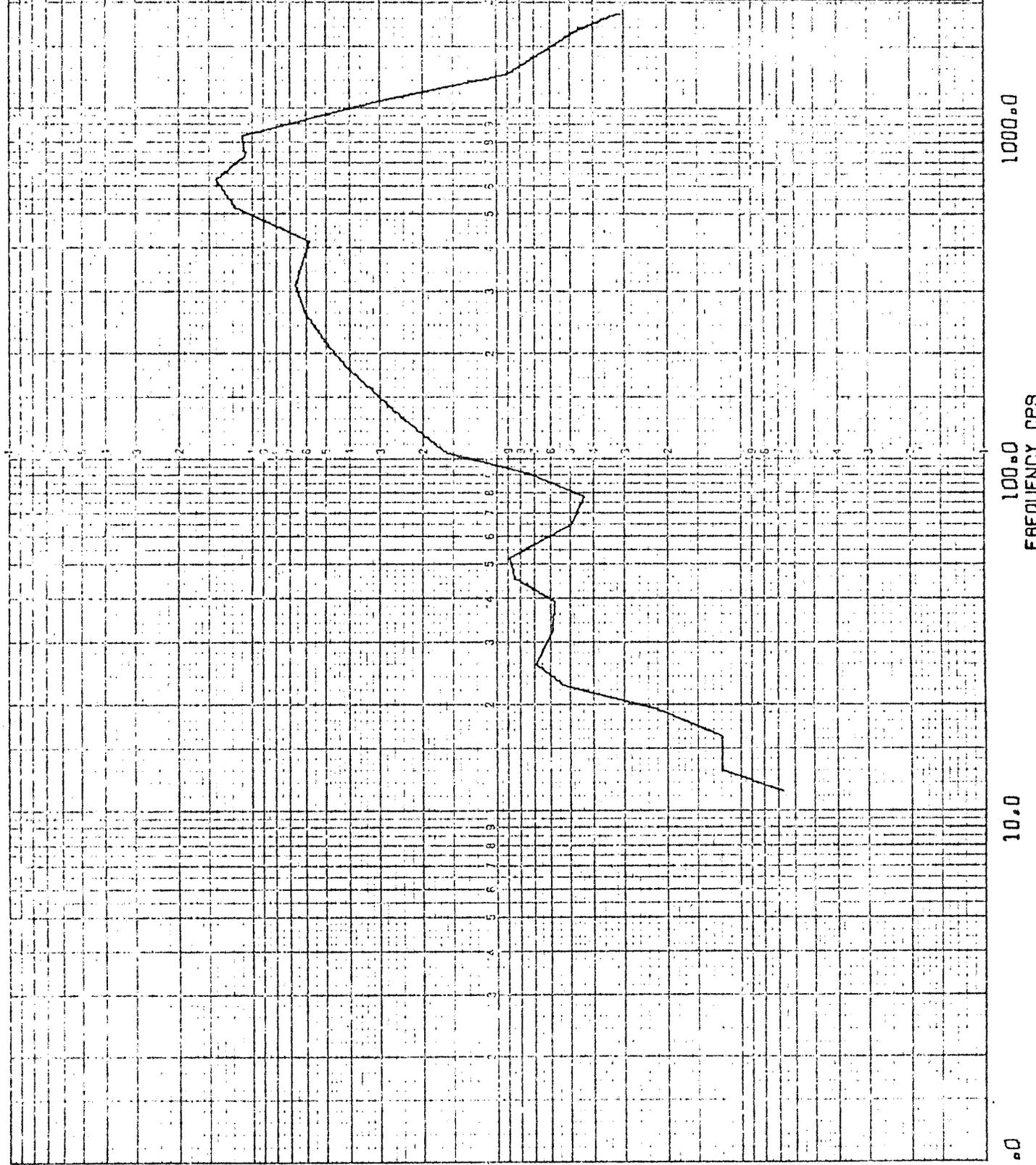
DSV-48 RANDOM VIBRATION TEST

TRANSDUCER: SOUND PRESSURE LEVELS, SPECIMEN 1 (U36/U36A)

CONFIGURATION  
P/N 1A68708-

TEST CONDITIONS	
TEST DATE	8-3-56
AXIS OF EXCITATION	U
PICK-UP NUMBER	2
PICK-UP RESPONSE	C
INPUT ACCELERATION PER PAGE	14.22
RMS VALUE	30.4

NOTE  
SEE PAGE 81 FOR  
PICK-UP LOCATION

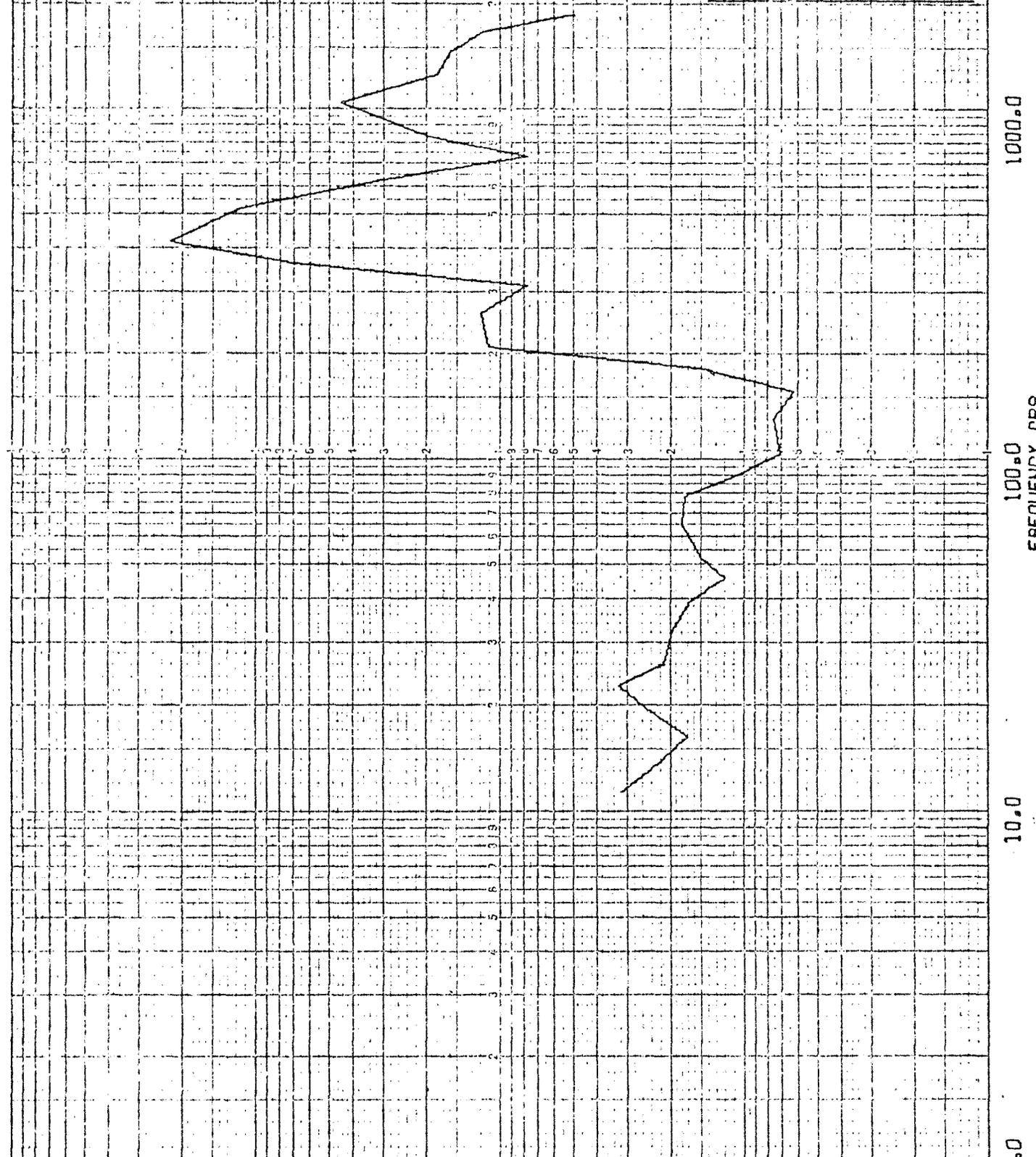


DSV-48 RANDOM VIBRATION TEST  
TRANSDUCER SOUND PRESSURE LEVELS, SPECIMEN 1 (436/W36A)

CONFIGURATION  
P/N 1R68708-

TEST CONDITIONS	
TEST DATE	3-3-66
AXIS OF EXCITATION	C
PICK-UP NUMBER	3
PICK-UP RESPONSE	A
INPUT ACCELERATION PER PAGE	1.42
RMS VALUE	26.1

NOTE  
SEE PAGE 81 FOR  
PICK-UP LOCATION

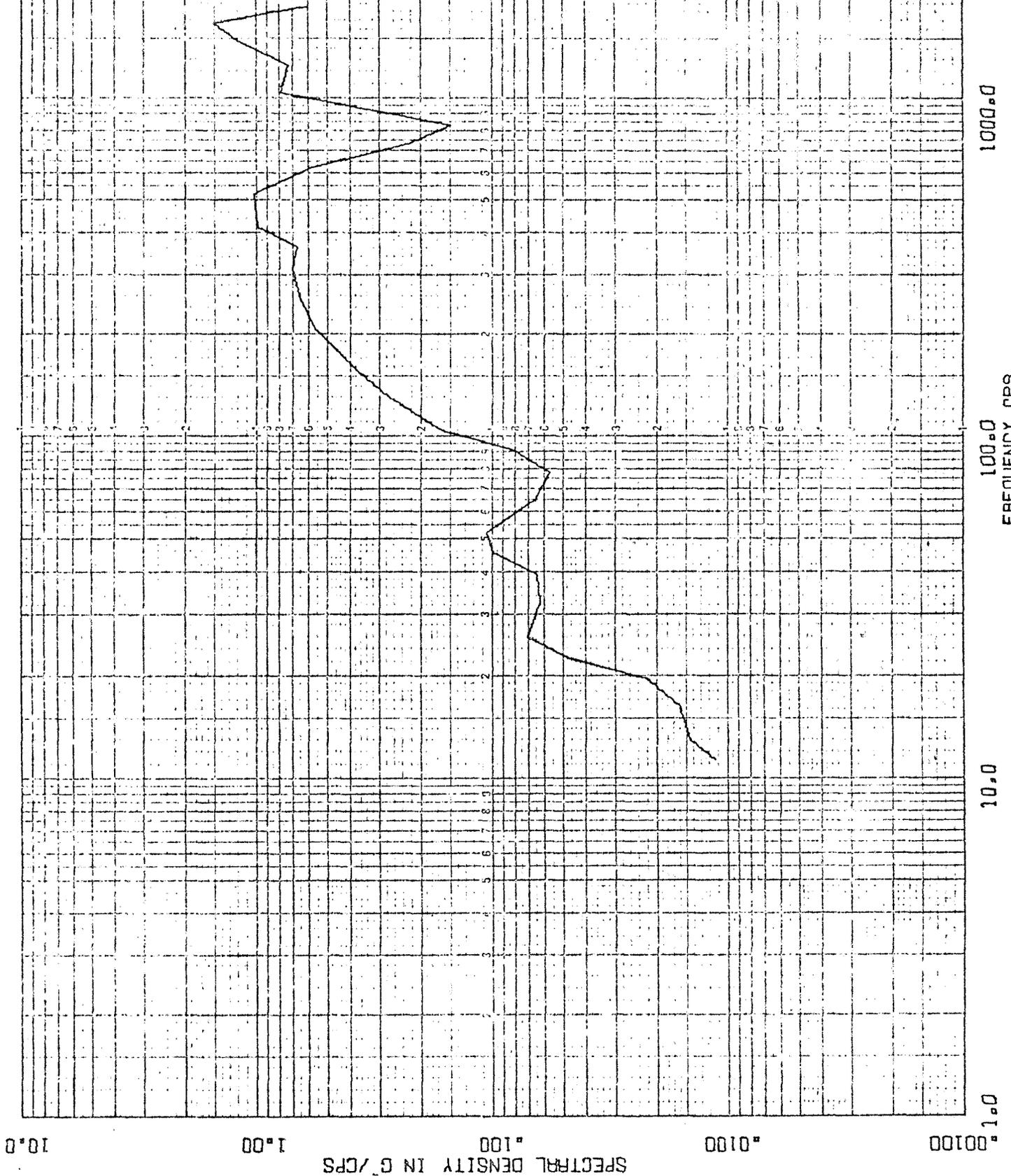


DSV-48 RANDOM VIBRATION TEST  
TRANSDUCER, SOUND PRESSURE LEVELS, SPECIMEN 1 (U36/W36A)

CONFIGURATION  
P/N: 1A68708-

TEST CONDITIONS  
TEST DATE: 3-3-66  
AXIS OF EXCITATION: 0  
PICK-UP NUMBER: 4  
PICK-UP RESPONSE: C  
INPUT ACCELERATION PER PAGE: 0.42  
RMS VALUE: 40.1

NOTE  
SEE PAGE 81 FOR  
PICK-UP LOCATION



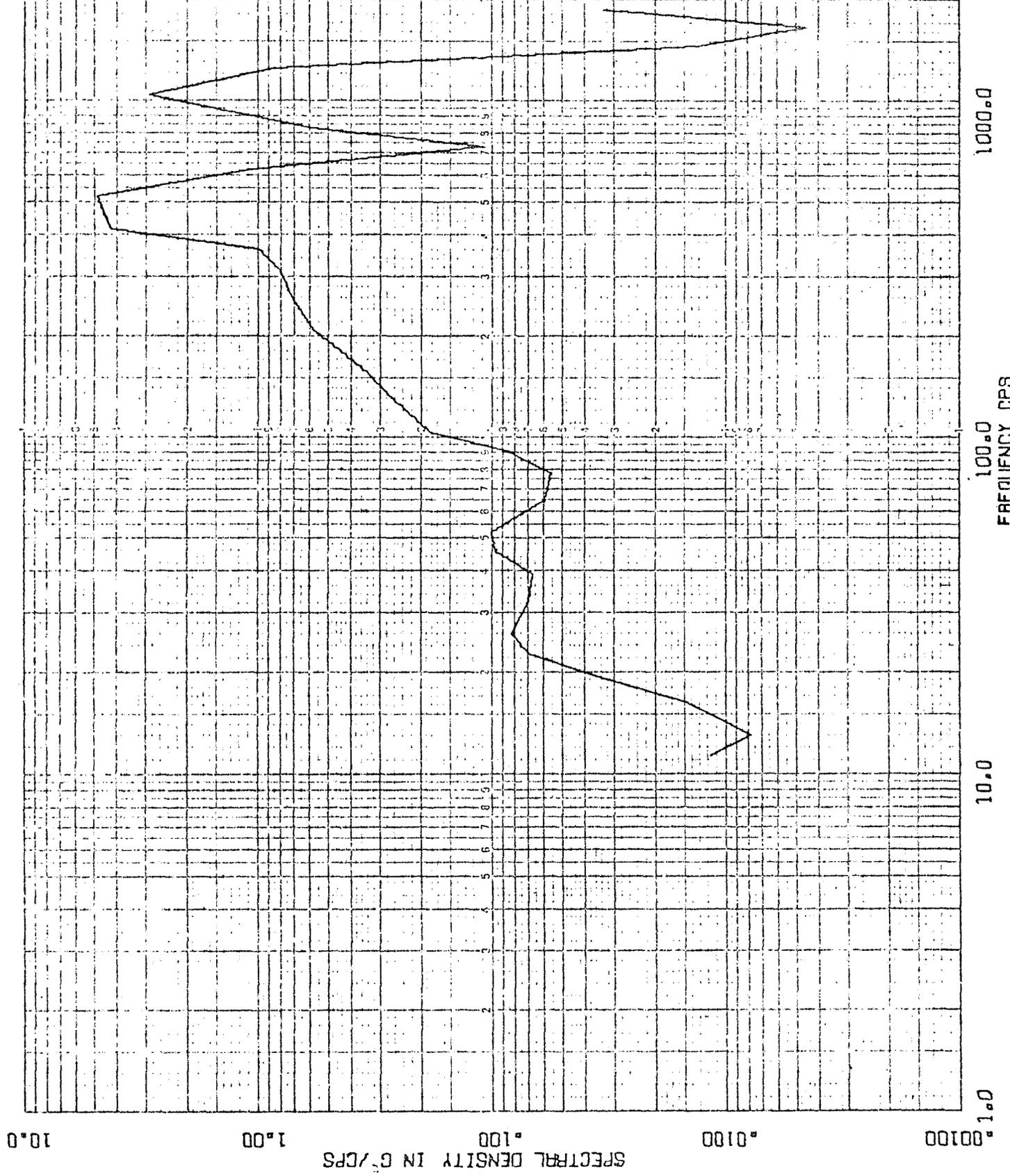
DSV-4B RANDOM VIBRATION TEST

TRANSDUCER: SOUND PRESSURE LEVELS. SPECIMEN 1 (436/436A)

CONFIGURATION  
P/N 1R69708-

TEST CONDITIONS  
TEST DATE 3-3-66  
AXIS OF EXCITATION C  
PICK-UP NUMBER 5  
PICK-UP RESPONSE C  
INPUT ACCELERATION PER PAGE 1.472  
RMS VALUE 48.0

NOTE  
SEE PAGE 81 FOR  
PICK-UP LOCATION



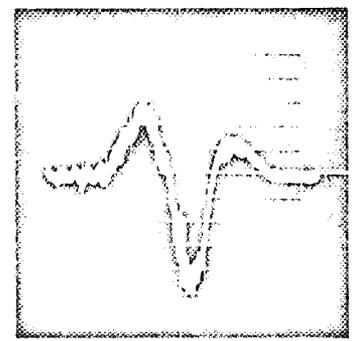
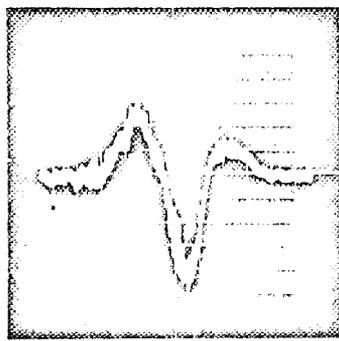
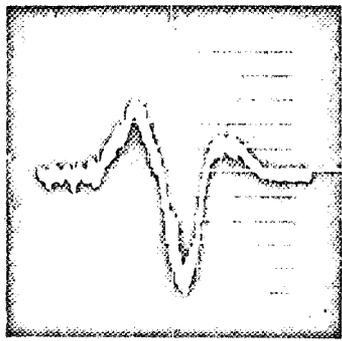
NOTE:  
 READING IS FROM  
 RIGHT TO LEFT.

SHOCK PULSE

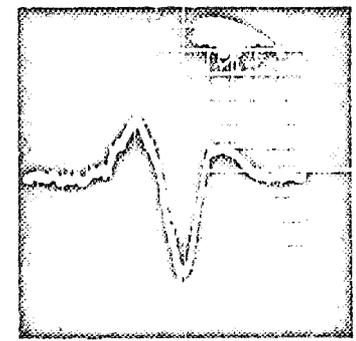
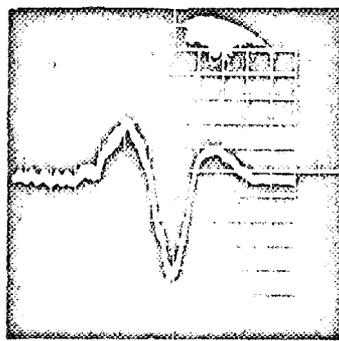
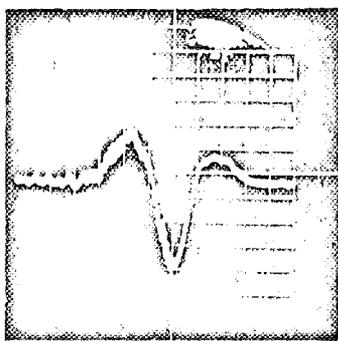
760-0504  
 2788--5  
 2800-52

5 G/DIVISION

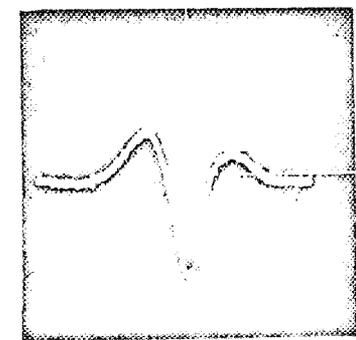
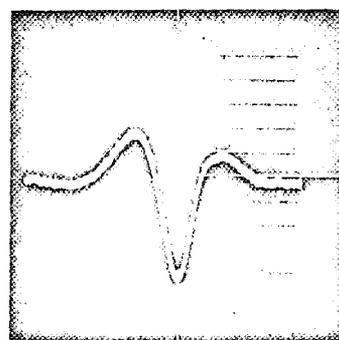
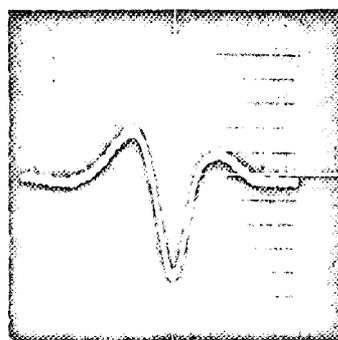
5 M. SEC/DIVISION



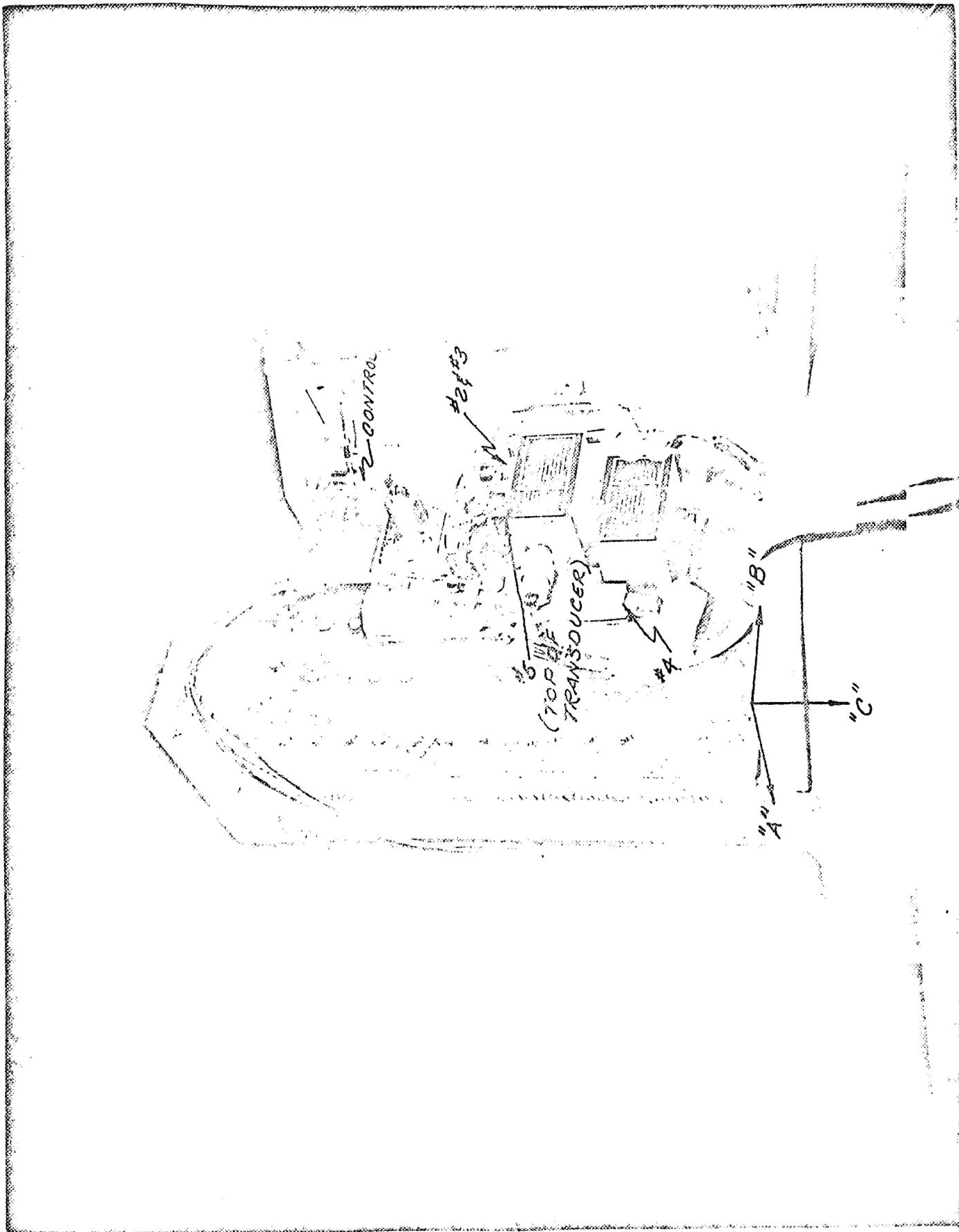
A AXIS



B AXIS



C AXIS



GENERAL TEST SET UP; AXES DEFINITION; PICKUP LOCATIONS